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Why We Use a New Currency: The Role of Trust and Control in Explaining the Perception and Usage of Bitcoin

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Title

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The Role of Trust and Control in Explaining the Perception and Usage of Bitcoin

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy of Public Policy and Administration at Virginia Commonwealth University, L. Douglas Wilder School of Government and Public Affairs.

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Through this dissertation, I believe I have created a useful contribution to the field of public policy and administration and underlying social sciences of economics, sociology, and information science. There are many ways in which this dissertation about socio-economic value and exchange is a culmination of several threads of my life-long personal, professional, political, and academic pursuits and I am thankful to all who have helped me in those areas over the years, so I could blend those vectors now. As I have been helped, I look forward to helping other intellectual pilgrims on their journeys to wherever they are headed.

Abstract

Social media, e-commerce, global peer-to-peer technologies, and the near ubiquity of computers and smartphones allow people to interact, trust, and exchange value across traditional socio-economic control boundaries and over significant distances. Since the creation in 2008 of a new cryptographic currency system called Bitcoin, a financial technology market sector of about 250 billion USD has rapidly emerged, raising questions about the nature of currency in society and whether new types of non-national money are warranted and viable. This debate has pitted heterodox economic interests against orthodox economic interests while it has rekindled interest in theories that view money as a social construct with a multitude of potential forms beyond 'state' or fiat money, and in forms that are increasingly predicted to be purely digital in the future. This study seeks to explain the policy, social, and economic factors that underlie perceptions and usage of these new currency types. First, I develop a novel theoretical matrix of *trust* and *control* to explain the conditions under which people choose to use any monetary system. Then, I test this theory with a quantitative analysis of policy, trust, socio-economic, and cultural factors affecting the perceptions and usage of the new currency systems of Bitcoin and other cryptocurrencies in 28 countries. This analysis draws on usage metrics recorded from the Bitcoin and cryptocurrency network systems, attitudinal data from the World Values Survey (WVS) and European Values Study (EVS), and a proprietary survey of Bitcoin and cryptocurrency perceptions and usage in 15 countries conducted by Ipsos for the behavioral economics research department at ING Group. I performed principal component analyses (PCA) to reduce factors among collected metrics, and I then integrated the findings of the PCA into a series of ordinary least squares (OLS) regressions along three primary vectors: trust, control, and culture. Based on my empirical findings, I group these new currency system users' personality perspectives into four categories: Evangelists, Pragmatists, Skeptics, and Speculators. The analysis finds Bitcoin and cryptocurrency perceptions and usage are not correlated with the strictness or laxness of public policies concerning Bitcoin and cryptocurrencies. The analysis also finds Bitcoin interest as measured by Google Search Trends is not correlated to Bitcoin and cryptocurrency perceptions and usage but is correlated to several lower socio-economic metrics related to crime and lack of confidence in law enforcement and government control. There is more favorable perception and usage of Bitcoin and cryptocurrency in countries with less developed socio-economic profiles, and less favorable perceptions and usage in countries with more developed socio-economic profiles. There is more favorable perception and usage of Bitcoin and cryptocurrency in countries with aggregate lower generalized trust and lower democratic tendencies, and less favorable perceptions and usage in countries with aggregate higher generalized trust and higher democratic tendencies. Overall, the findings show the extent to which trends in usage and perception of the emergent currencies of Bitcoin and other cryptocurrencies are associated with basic cultural and attitudinal tendencies that are not necessarily related to public policy or other typical monetary theory-based controls. I conclude that a matrix of trust and control is effective at demonstrating how sociological factors explain the landscape of historical, extant, and emergent currency systems and this matrix predicts where Bitcoin and cryptocurrencies situate in society relative to these other currency systems.

Table of Contents

Table of Figures, Charts, Tables

Introduction

Since the late 2008 declaration of a new non-state cryptographic currency system called Bitcoin, the last several years have witnessed the creation of an entirely new financial technology sector with over $500 billion in direct capitalization (Williams, 2017) and hundreds of billions in organizational investment from new financial companies – 'fintech' – and old financial companies alike (Bose, Price, & Bastid, 2018).[1] Within this new financial sector, Bitcoin itself represents just 35% of the overall sector by market capitalization. The other 65% of the market capitalization is from dozens of other major new non-state cryptographic currencies and hundreds of minor ones (Cornish, 2018). Collectively, Bitcoin and non-Bitcoin cryptographic currencies are generally referred to as cryptocurrencies; a larger classification called digital currencies includes those non-state cryptocurrencies and also the traditional central bank and inter-bank currency systems that have begun to consider digital platforms. As depicted in Figure 1, the Bank for International Settlements (BIS) developed a "money flower" Venn diagram that has been widely regarded as useful to disambiguate the overlapping terms used for various types of currency (Bech & Garratt, 2017).[2]

[1] Bitcoin (with a capital B) is the system which contains bitcoins (with a lower case b)

[2] For the purposes of this research, the phrase 'Bitcoin and cryptocurrencies' is frequently used to be clear about the breadth of the topic of inquiry and refers to non-state, non-central bank issued cryptographic currencies. There are instances where only Bitcoin or only cryptocurrencies is referenced because there are distinctions within the research in some cases. The phrase 'digital currencies' is used to refer to all types of currency, state, non-state, central bank, non-central bank, that have been or may be digitized from their physical form(s). All digital currencies present questions about individual users' perceptions and usage and regulatory control, Bitcoin and cryptocurrencies especially, and so it is important to distinguish them from traditional currencies otherwise in use today. Great care has been taken to keep these terms consistent throughout this research.

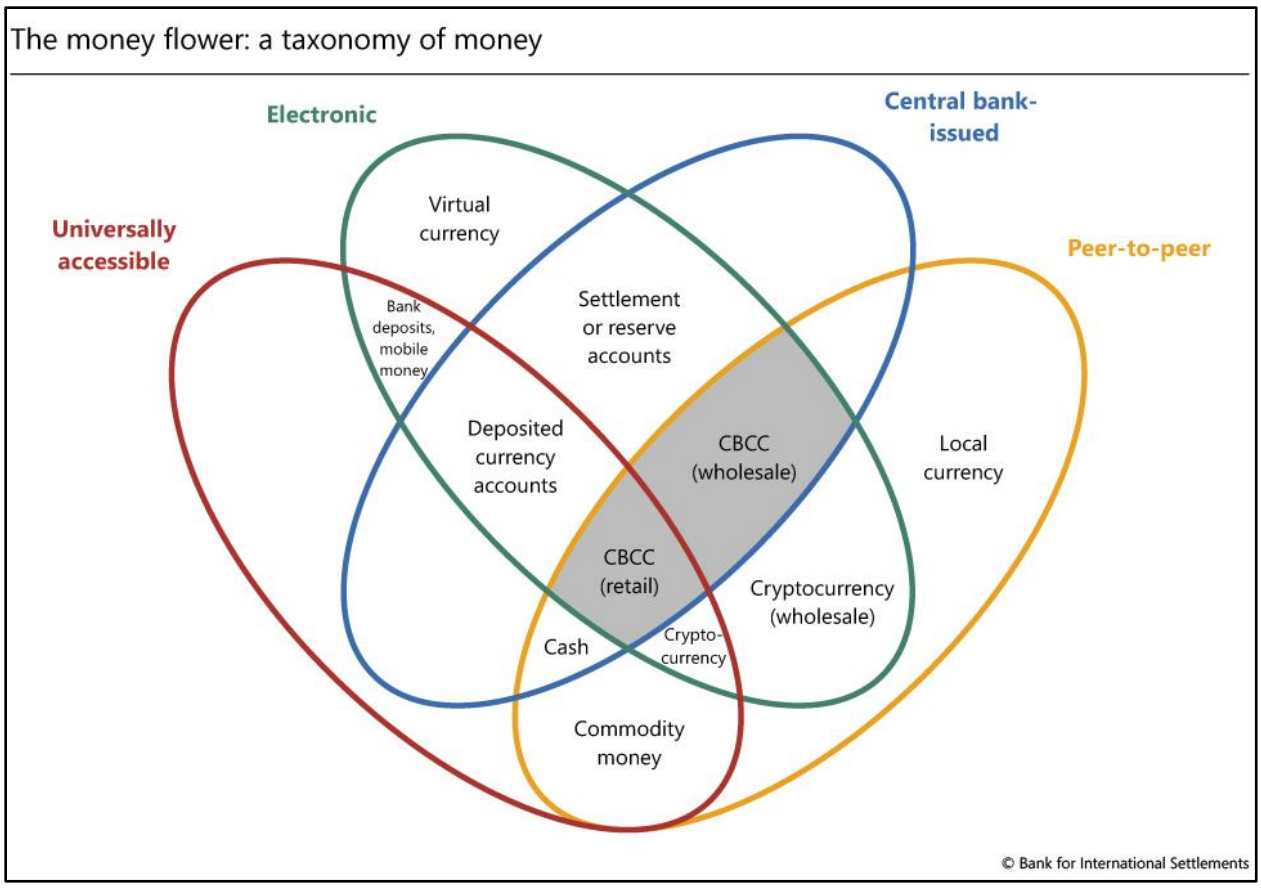

Figure 1. BIS "Money Flower" Taxonomy of Money[3]

Within the overall Bitcoin and cryptocurrency sector has blossomed a cottage industry of speculators, purveyors, enthusiasts, and detractors – and an increasingly familiar boutique of exotic financial products and derivatives. Meanwhile, governments and financial interests around the world consider whether and how to react to the new realities of digital currencies. News reports regularly feature stories of hostage-taking in exchange for Bitcoin and cryptocurrency, computer hijackings (ransomware) in exchange for Bitcoin and cryptocurrency,

[3] The BIS Venn diagram's terms have evolved since its 2017 debut. The sector's evolving terminology and this research consider the grade-shaded areas as traditional central bank currencies (central bank digital currencies, or CBDCs, which, in 2017, were referred to as central bank cryptocurrencies, or CBCCs, but the stigma of crypto- has since been replace with the word digital by the central banks themselves), the cryptocurrency areas in the diagram are Bitcoin and cryptocurrencies, and the overall green oval are all digital currencies. Again, great care has been taken to keep these terms consistent throughout this research.

and speculators (including teenagers) making millions of dollars in mere months (Johnson, 2018; Chavez-Dreyfuss, 2018). News organizations have taken to running regular news and features about the phenomena of Bitcoin and cryptocurrency, and there have arisen several new Bitcoin and cryptocurrency trade journals that cover the sector's daily ups and downs, while numerous existing trade journals have shifted coverage to the possibilities of digital currency. With recent instability in countries like Venezuela, some people have avoided the national currency's 1.7M % annual inflation rate and converted their financial holding entirely into Bitcoin (Hernández, 2019).

The two *basic* properties of any currency are its ability to be a store of value (SoV) and medium of exchange (MoE). With those two criteria in mind, while the general public may be dismissive of Bitcoin and cryptocurrencies when they first hear of them, they have similarities to other long-standing non-national currencies like loyalty program "points" or frequent flyer "miles" from airline flights or airline-linked credit card use (Blanc, 2011). Numerous other industries have rewards and "company credits" that can be considered currencies in basic senses of the word despite not being backed by a public institution, and these initiatives may expand greatly in the future: for example, recent polling indicates overwhelming public support for an Amazon "store credit" in the form of a cryptocurrency (Rooney, 2018a). Rare comic books, rare baseball cards, Chuck E. Cheese tokens, and even collectible money – which can have a market value many times greater than its face-value – are other examples of non-national, alternative currency systems that the public exchanges or on which it speculates because of the expectation that these objects will hold or increase their value. In the last few decades, numerous regionally-based complementary currency systems have also emerged around the world. These systems link many kinds of community contributions (e.g., loyalty, gifting, volunteering, community

building) to an exchangeable unit of value often represented by a physical token or piece of paper (Seyfang & Longhurst, 2018).

The new distributed ledger, or blockchain, technologies that cryptocurrencies exploit arguably could make these complementary currency systems more viable, offering the scalability and accessibility of the internet coupled with the internet's ability to connect individuals across geographic and cultural boundaries – two powerful features that past technological innovations, such as email for communication and web browsing for information retrieval, have exploited to transform other areas of social and economic life. For example, while a regionally-focused (or any geographic community) complementary currency can still be met by non-digital systems, the introduction of cryptocurrencies means that supra-regional networks can more easily emerge to address the needs of a particular industry or social group. Non-Bitcoin cryptocurrencies like DentaCoin for the dental supply chain, KodakCoin for digital media copyrights, and HempCoin for marijuana merchants could function as a unit of account and medium of exchange for their specific industries and are examples of the new wave of socio-economic networks that can be connected by and trade value via cryptocurrency systems.

Before the advent of cryptocurrency technologies, complementary currencies were limited by their need for in-person exchanges. Furthermore, they used closed, proprietary platforms, often using paper or other physical mediums. Cryptocurrencies, however, face neither of these limitations. As such, they have gained more traction, more quickly, than those antecedent systems, and are rapidly being touted even as possible replacements for national currencies, with Bitcoin and larger cryptocurrencies like Ethereum (billed as a smart-contract currency system), Dash (billed as digital cash), and Litecoin (a Bitcoin variant) intended to appeal to buyers and merchants around the world in need of an apolitical and/or non-state store

of value and/or medium of exchange. Other emergent systems like Zcash and Monero are specifically privacy-focused cryptocurrencies with complex randomization and anonymization features to completely obscure transactions and the identities of those who hold the currency. Because of the peer-to-peer aspect of cryptocurrencies and their distributed ledgers, users are transacting with each other at little cost, and are doing so directly – not through an intermediate private or central bank, or state system.

The rapid emergence of cryptocurrencies has obliged numerous governments and other public and private organizations to respond in a variety of ways (Rooney, 2018b). Some have imposed, or begun regulatory and legislative processes to impose, policies affecting cryptocurrency transactions, among them:

1. levying taxes on trading profits from cryptocurrencies
2. considering money laundering vectors and settling theft claims involving cryptocurrency's use
3. permitting cryptocurrency use for political campaign finance or tax remittance
4. banning the usage of cryptocurrencies, and
5. contemplating public-sanctioned versions of cryptocurrency to complement or supplant their own traditional currency systems (McKenna, 2017) with replacements to traditional currency systems by all-digital currencies

A concerted policy response by any particular government has been made more difficult because often multiple departments of the same government, which each regulate a different aspect of money, disagree about the nature of Bitcoin and cryptocurrency – whether they are an asset, security, currency, investment, novelty, or nothing at all. The U.S. Securities and Exchange Commission uses the "Howey Test" to determine whether a purchase or sale is an

investment contract, but that is not a simple determination for cryptocurrencies, and the rest of the world has not refined their regulations even to that point.[4]

Some governments, like China and India, have expressed outright hostility toward Bitcoin and other cryptocurrencies. In the U.S. and other wealthy countries, policymakers have tended to take a more cautious stance, with the goal of letting the nascent technology grow for the users. Regulations tend to be light, a matter of preventing outright fraud and abuse of the systems. A third group of countries are pursuing strategies to tap potential economic development opportunities arising from Bitcoin and cryptocurrencies: everything from being "crypto friendly" by holding off on any regulation, like Switzerland is currently doing, to actively considering a national digital currency, as Malta and the tiny Marshall Islands are doing (Bloomberg Crypto Ed., 2018). For countries facing economic sanctions, Bitcoin and cryptocurrencies may also have geopolitical benefits. Venezuela is contemplating a petro-backed national cryptocurrency, while Iran and North Korea are considering whether they, too, can skirt international sanctions on traditional fiat currency instruments by running their own national cryptocurrency (Thoms, 2018) or hoarding Bitcoins and other cryptocurrencies.

At the same time, the spread of cryptocurrencies has fueled anxiety within the financial sector. In their 2018 annual reports, Bank of America, J.P. Morgan, and Goldman Sachs all specifically cited digital currencies generally as a threat to their businesses due to the risk that cryptocurrencies may one day supplant traditional financial system functions or that pure digital currencies would render obsolete much of the banks' physical infrastructure (Hochstein, 2018). Major U.S. and U.K. financial institutions have also flagged digital currencies as a threat to

[4] The Howey Test is based on an 80-year-old U.S. Supreme Court case about landlords, rents, contract law, and investment via postal mail and under the auspices of U.S. interstate commerce regulation of a citrus grove in Florida – hardly an effective benchmark for Bitcoin and cryptocurrencies with global reach.

Automated Teller Machines (ATM) deployments, given that cryptocurrencies have no need for cash (De, 2018). In response to these sorts of concerns, Bank of America, Capital One, J.P. Morgan, and Lloyd's Banking Group have banned the use of credit cards for buying cryptocurrencies, arguing that they need to support anti-money laundering protections and also protect themselves and their customers from buying something that might rapidly decline in value or cease to exist completely (Harrow, 2018). Nevertheless, these market interventions may also be aimed at stunting the growth of competitive digital currency systems that could obviate these banks' existence.

These developments raise several questions. First, to what extent does governmental regulation of Bitcoin and cryptocurrency use matter in terms of consumers' perceptions and behavior and overall market activity? Second, if the demand for Bitcoin and cryptocurrencies are driven by latent societal factors, what are they? In the case of Bitcoin and cryptocurrency, little belief or faith in democratic institutions or weak socio-economic development in certain countries could provoke their citizens to use them out of a desire to find a reliable medium of exchange. In contrast, countries with highly developed democratic institutions and stable or growing economies could have many citizens who are interested in Bitcoin and cryptocurrencies because they want to invest in promising speculative instruments. Understanding the specific factors that drive consumer demand for cryptocurrencies can make policies to regulate them more effective, enforceable, and likely to promote the public good.

To these ends, this study examined how country-specific public policy and social factors are related to Bitcoin and cryptocurrency perceptions and usage. It developed an original and rigorous approach toward measuring Bitcoin and cryptocurrency perceptions and usage and to assessing public policies related to cryptocurrencies. Given that Bitcoin – by far the largest

cryptocurrency – and other cryptocurrencies are radically new types of currency system often explicitly intended to be decentralized and difficult to trace (as further explicated below), research to construct such measures can by itself contribute significantly to our understanding of *all* digital currency systems perceptions and usage. Do individuals want decentralized and difficult-to-trace currency or just easier ways to execute transactions?

This study also put forward a new theoretical typology by which to categorize different types of socio-economic value and exchange, one that accounts for the unique characteristics of Bitcoin and cryptocurrencies while also putting them in the context of a wide range of previously developed currencies (e.g., fiat, specie, non-state, and hawala). From this theory, I made claims about the specific conditions under which we might expect each type of currency to proliferate. I then used data relating to Bitcoin and cryptocurrency perceptions and usage to test these claims.

Some broad questions about the digital currency phenomena, which this proposal clarified, are:

1. What constitutes cryptocurrency perceptions and usage and how can these be measured?
2. What public policies are related to cryptocurrency perceptions and usage and how can this association be measured?
3. What societal factors are related to cryptocurrency perceptions and usage and how can this association be measured?

The ultimate goal of this theoretical and empirical investigation was to further our understanding of the social nature of currency and the ways that cryptocurrency might serve to complement or even supplant traditional central bank currencies and related aspects of government and the state. Given their rapid growth, Bitcoin and cryptocurrencies appear to be

filling some sort of need within society and markets – but there is little research explaining why and where this is happening. Understanding Bitcoin and cryptocurrencies' use is vital to public policy debates as governments grapple with new questions about the nature of money in society and the role of policy responses to new technologies, as well as how traditional central bank and inter-bank systems can be successfully digitized.

Literature Review

Theories of money, currency, and socio-economic value and exchange

One of the things Bitcoin unwittingly unleashed in 2008 was a rekindled debate over the nature of currency that had been simmering for many years as globalization increased. William Stanley Jevons (1875) is often credited with explicating the first forthright, modern description of money. Money, he argued, served four basic purposes: a medium of exchange (currency); a common measure of value (commonly accepted); a standard of value (ability to convey as credit or debt), and a store of value (long-term savings).[5] Jevons's writing on this topic fell in line with the dominant perspective that had prevailed among Enlightenment political economists, who had seen money solely in terms of merchant's utility – metaphorically, Adam Smith's "self-interest" aggregating as an "invisible hand" where "all money was assumed to be capital" (Graeber, 2011). At that time, currency was considered a *universal equivalent* of economic values. Even as capitalist systems expanded greatly over the next century, later theorists would not stray far from this narrow understanding of the nature of money.[6]

[5] However, more recent theories about money and currency put the number of properties at eight: intrinsic value, face value, incentive value, payment mechanism, trust proxy, cultural assertion, unit of value, and interest-bearing value (Visser & McIntosh, 1998)

[6] Karl Marx (1959), for instance, considered money "the object of eminent possession," the ultimate manifestation of property.

Sociology in the late 19th century began to superimpose on the "market money" of Smith and Jevons the idea that money was a social construct and not merely a mechanical lubricant for economic pursuits that had supplanted barter, and novel sociological theories looked deeper into society than the then-present day economy. The semioticians Ferdinand de Saussure and Charles Peirce saw money as a construct of understanding, one limited by the extent to which the common understanding was mutual; in other words, the symbolic nature of currency inherently imposed a centralized form of control on its usage, given to these socially accepted understandings of its value (Dyer, 1989). These early theories led to more specific considerations of the social nature of money as a linguistic and symbolic carrier of social bonds. Georg Simmel (2011) in the early 1900s described currency as a "claim upon society" – an implicit contract between the user and society. Sally Frankel (1976) argued that money embodied the perpetual conflict between the individual and the centralized control inherent in modern economies. Mid- to late-20th-century economists like John Maynard Keynes, Friedrich Hayek, and Milton Friedman tried to square – from different ends of the political spectrum – conflicting notions of money as *the* universal equivalent and an evolved social glue enabling economic stability and freedom.

At the start of the 21st century, David Graeber (2001) argued for an "anthropological theory of value," which effectively demotes money to merely one kind of social value, with others being concepts like trust, love, and sense of community. He later extended this theory by focusing on what he called a more fundamental aspect of value: debt. His seminal 2011 review of the 5,000-year history of debt made the case that debt has always been the main and most important *attribute* of money, regardless of money's *function*, but here Graeber also underscored the fact that societies understood "debt" to be not just a monetary obligation, but also a social

one. Indeed, Graeber's history notably described how the ancient civilization of Yap exchanged thousand-pound stones between cooperating villages, in one of the earliest documented examples of currency. These stones were signs of indebtedness between villages and within early tribal relationships in what was essentially a gift economy. More popular among early civilizations, of course, were relatively more modern notions of currency: cowrie shells and rare-earth substances like gold, copper, iron, and gemstones. The defining characteristic of these varied forms of money was the way they exchanged indebtedness among their users. These exchanges were closely tied to – but did not supplant – barter trade. Such currency-related trade continued for thousands of years, with gold and silver eventually becoming the dominant forms of currency in Western societies.

Recognizing the social nature of money rather than just the economic nature of money challenges the conventional view that *centralized* currency is a *natural* outgrowth of ever more complex and transactional socio-economic activity. It also allows social scientists to focus on the increasingly important role money has played in modern societies as a tool of sovereign nations to meet the needs of national public policy and political goals, with currencies directly, and some ways indirectly, imposed upon the public. In the United States, for example, Alexander Hamilton – who argued in favor of a strong national government in various other policy and administrative areas – also advocated for central banking because of the political power it would consolidate, recognizing how the Bank of England had helped centralize power in the United Kingdom centuries earlier. Hamilton posthumously is credited with the idea for the U.S. Federal Reserve system, which was fully developed in the early 20th century. However, of the last 2,500 years of centralized currency systems and 200 years of "ardent study" of them have come monetary systems that are not satisfactory (Galbraith, 1975). Highly refined central

bank currencies continue to draw criticism about their failures to manage the tension between inflation and employment and pernicious market bubbles and recessions.[7] They are also criticized for not fully accounting for all of society's costs from market externalities like pollution or global pandemics to social exigencies like prison population management or slowing population growth – which are significant aspects of society and the economy that even proponents of centralized currencies cannot square with the typical econometrics they use.[8] More recently, a growing body of research attempts to account for the failure of prevailing currency systems to account for emotional labor and relational work, the glue that underpins dominant economic narratives (Zelizer, 1989).

Bitcoin, cryptocurrency, and digital currency

A view of money as a social construct and not just an economic lubricant also inevitably raises questions about whether forms of currency other than state-sanctioned money could complement or replace central bank currencies. Skepticism of, and resistance to, the primacy of central bank-regulated state currencies peaked during the global financial crisis of 2008. As global markets crashed that year, an anonymous actor or group of actors (henceforth referred to by last name or in the third-person plural) going by the name Satoshi Nakamoto (2009) finalized and published a specification for Bitcoin, a digital currency system based on computer

[7] Recent analysis indicates "between 1970 and 2007 there were 124 systemic banking crises, 208 currency crises, 63 episodes of sovereign debt defaults while between 1670 and 1970 there were 48 major crashes [monetary and/or currency related]" (Lietaer, et al., 2012).

[8] The concerns that national currency systems might not be serving society holistically have even arisen among financial elites. In 2018, Leonard Fink, the CEO of BlackRock – the largest investment fund in the world, with USD 6 trillion in holdings – indicated corporations seeking investments from BlackRock would need to demonstrate their social value and not just their profitability (George, 2018). This demonstrates the growing sense of concern about the purely economic utility of modern currency systems. While there have been centuries of central banking and decades of highly technocratic monetary policy post-WWII – the Bretton Woods system – the largest investment firm in the world is now specifically seeking social value in addition to profitability to win its investment.

cryptography. According to Nakamoto, one of the purported strengths of the Bitcoin currency system was that it was computed to have a fixed supply of currency (21M bitcoins) that would keep inflation and business cycles in check as opposed to central bank systems that could print unlimited amounts of currency, which Nakamoto believed leads to inflation and business cycle bubbles. Over the next several years, this technological novelty of cryptographic currency inspired thousands of variants and great public interest – with "bitcoin" becoming the third most searched Google term in 2017. Prior to 2008, there had been various ideas bandied about for denationalized currencies – among them, Friedrich von Hayek's (1990) treatise on denationalized currency, electronic cash in the mid-1980s (Moore, 2013), e-gold in 1996 by Douglas Jackson (2007), "bit gold" as a digital coin in 1998 (Szabo, 2008), and even a prediction by Milton Friedman in 1999 that internet e-cash would one day emerge (Cawrey, 2014).[9] However, no serious efforts had been made to launch any of these ideas on a global scale. Nakamoto's surprise release of a scant eight-page technical specification for Bitcoin not only introduced a fully formed and practical system for value exchange entirely by computer system but also provided a concise political manifesto on behalf of its widespread use. Nakamoto's stated motivation was the global financial crisis, which they believed was directly caused by the political nature of monetary systems in the U.S. and other major nations.

Their solution was relatively simple: Bitcoin would be comprised of discrete units (bitcoins or decimal fractions thereof) on an electronic ledger, distributed among any participant in the system by using cryptography similar to modern secure internet transactions. This

[9] Szabo is seen by industry experts as possibly the real Satoshi Nakamoto (Popper, 2015) or part of the group behind Satoshi Nakamoto. Szabo has been at the forefront of the digital currency debate and discussion for decades and especially since the publication of the bitcoin whitepaper. He is something of a polymath and has been a central character in various forums about computer cryptography, currency systems, and other information systems, as well as a variety of social science topics.

distributed ledger (called a blockchain) records a chain of activities in an immutable – if pseudo-anonymous – form.[10] The public ledger is maintained by computer network nodes that process transactions to earn coins and compute cryptographic algorithms to mine new coins to be used in the network. Nakamoto's design with this method of node interaction was to mimic the mining of gold or other rare-earth physical currency types.

With the growth of Bitcoin in the years after 2008, numerous other cryptocurrencies emerged that relied on the same type of distributed ledger technology and included interesting new features like executable code (in the case of the cryptocurrency Ethereum) and pure random number generation and proxied transmission to make its use truly anonymous (in the case of Zcash and Monero). One notable class of cryptocurrencies that has emerged is Distributed Autonomous Organizations (DAOs), where the transactions and behavior of the cryptocurrency are intended at the outset as a digital commons for the creation and execution of software code – known as "contracts" – that are proposed and voted on by holders of the currency, which can take on a life of their own, beyond those who started them. These DAOs, like all distributed ledger currency systems, rely on the consensus of all participating nodes to settle the transactions and for future changes to the network, which could include even a decision to cease to exist, if that were the consensus of the holders (like DigixDAO recently did).

The International Monetary Fund (IMF) has generated a widely regarded illustration of virtual currencies that is helpful to clarify the overlapping terms in the cryptocurrency field (He, et al., 2016). Figure 2 illustrates various types of cryptocurrencies and how they relate to digital currency.

[10] This distributed ledger has gained a life of its own as a significant new technology for improving business and administrative processes. It was based on patented technology processes by W. Scott Stornetta and Stuart Haber (Stornetta & Haber, 1991).

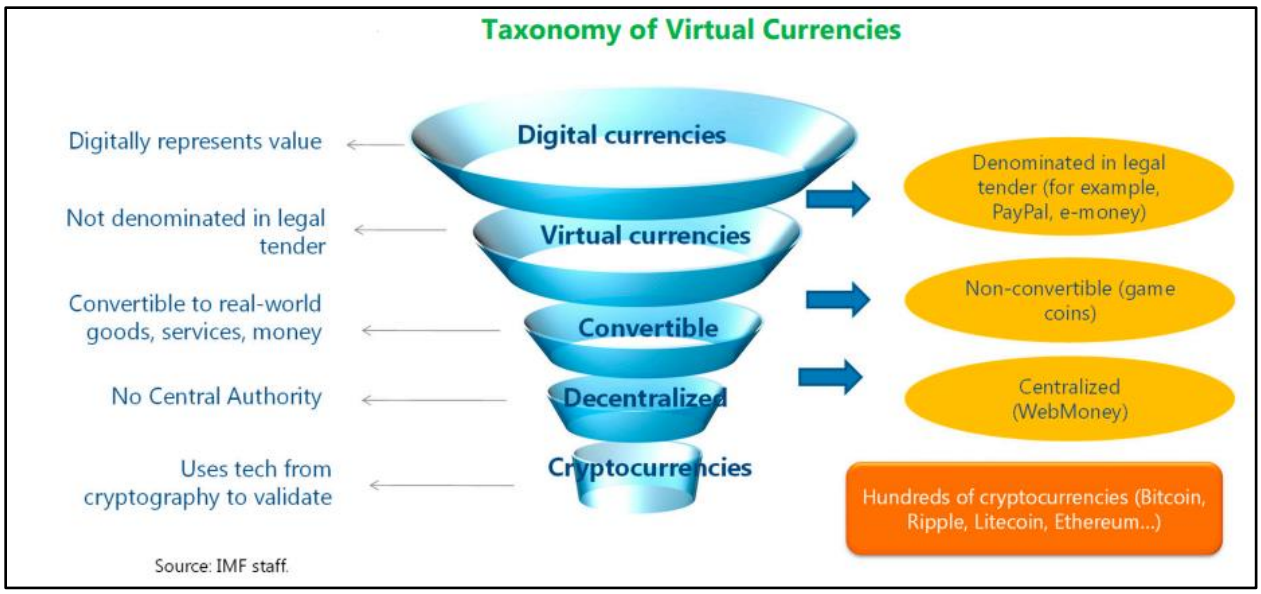

Figure 2. IMF Taxonomy of Virtual Currencies

One of the most critical parts of the infrastructure for all these cryptocurrencies is the ability to buy and sell the units (coins or multi-decimal fractions thereof) from other users. To this end, dozens of major exchanges and hundreds of minor ones have sprouted up around the world. The initial purchases on an exchange are usually made with fiat national currencies through a computer browser or with a smartphone, usually by buying bitcoin or one of the other main cryptocurrencies (e.g., Ethereum, Ripple, or a USD-backed stablecoin); then exchanges and trades can be made into any other cryptocurrency.[11] Once the purchase is cleared, the coins function just like cash and stocks in a stock exchange. Coins can be transferred among supporting exchanges or to a user's digital wallet, which effectively takes the coin out of third-party control and gives the user direct custody of the coin, whereby it can be spent at merchants that accept that type of coin in exchange for goods or services. Using this system, users can

[11] There are two main exchanges that function like Craigslist.com for cryptocurrencies, localbitcoin.com and Paxful. These link buyers and sellers in a marketplace and the exchanges can and do often take place offline.

securely transmit large amounts of cryptocurrency around the world and with complete confidence in the transfer, based on the consensus of the network nodes.[12] The exchange process may take anywhere from a few seconds to a few minutes, and cost merely small decimal fractions of the currency (regardless of the size of the transaction itself) paid to the nodes that confirm the transaction to achieve an authoritative settlement. By contrast, in the traditional currency world, wire transfers take a minimum of 18 to 24 hours and typically have high fees associated with them; for retail purchases using credit or debit cards in fiat currency, the third-party vendors typically charge the merchant a fee of 2% to 5% of the transaction total. A cryptocurrency transaction typically costs a few cents (USD) to a few dollars for any size transaction.

Within the cryptocurrency sector, investment and speculation (and a burgeoning catalog of familiar-sounding exotic derivatives and former Wall Street denizens) have grown in response to the popularity of Bitcoin and other cryptocurrencies. A recent trend for investment or raising capital is the implementation of Initial Coin Offerings (ICOs), which represent a company offering of cryptocurrency, much like a stock market Initial Public Offering (IPO), with the stated intention of using the cryptocurrency for other socio-economic goods and services once it is fully in production.[13] Recently the Chicago Mercantile Exchange started offering futures contracts relating to Bitcoin and cryptocurrencies, other traditional stock exchanges report

[12] The consensus process by which distributed ledgers running cryptocurrencies work is itself a technological innovation and breakthrough application in information systems and science research, but an extended discussion of it is beyond the scope of the present research.

[13] An obvious question that often arises in this sector is: if cryptocurrencies are superior to fiat, why do ICOs want to exchange their new cryptocurrency for fiat? The answers to this question vary based on the legitimacy of the agents behind the ICO.

cryptocurrency indices, and many cryptocurrency exchanges offer margin trading to provide speculators and investors the ability to short-sell cryptocurrencies.

Meanwhile, cryptocurrencies designed as tokens (like Verge or MakerDAO) are being developed to complement an entire marketplace of goods and services, which can be exchanged for no cost within the system for transactions using the tokens. These token systems are very much like loyalty points systems for credit card usage or airline travel or the Amazon "store credit" discussed above. Recently, Facebook announced an intention to lead a large group of private-sector organizations in the creation of a "basket" currency call Libra that would be a stable medium of exchange for online sales and market activities. This has been met with significant skepticism from regulators in the U.S. and other countries and its future, at least as initially envisioned, is in doubt. But Libra's slow start foreshadows more efforts in the future from industry and even smaller countries to take advantage of new technologies to attain new relevance in the modern economy.

With such network systems rapidly developing, there have been numerous reports of thefts and technical glitches that cost users time and money (of various types). These incidents are not unique to cryptocurrencies, and supporters of cryptocurrencies compare them to happenings in the traditional currency world, for instance, when someone's purse or wallet is stolen, a bank error occurs, an armed robbery of a bank takes place, or a corporation defrauds customers of their assets.[14] What has not occurred in the first decade since the launch of cryptocurrencies, however, is any known instance in which the cryptography or the code of these currency systems was compromised by direct assault, destroying the cryptocurrency network or preventing it from running. Despite significant efforts by hackers to thwart its system, for

[14] Some of the ICOs as hinted about in footnote 13 above meet this definition of traditional corporate fraud.

instance, Bitcoin since inception has worked continuously with zero downtime and no central authority maintaining it. While there have been exploitations of human error in some of the cryptocurrencies, these were not "hacks" in the sense of malicious activity creating a vulnerability, they were just examples of poorly written code.[15]

So far, any inquiry into why people are turning to or avoiding Bitcoin and cryptocurrencies has largely been limited to gossip in trade journals and the Twittersphere's superficial speculation about political perspectives advocated by Bitcoin proponents – known as Bitcoin "maximalists" in the vernacular of the cryptocurrency world – that tend toward the libertarian or even social anarchist. Yet the need to understand public attitudes and behaviors regarding cryptocurrencies continues to grow because cryptocurrencies are a proxy for larger governmental efforts to digitize traditional currency systems. Users' perception of non-state cryptocurrency may or may not be similar to their perceptions of state-backed digital currencies. Such information is also particularly useful to central banks and governments, for instance, who have found that regulating Bitcoin and cryptocurrency effectively can be challenging. First, cryptocurrency systems are completely encrypted and inherently decentralized, making them very opaque to regulators even with extreme traditional investigation powers. Furthermore, they are entirely internet-based. Blocking them would essentially require blocking the internet, an untenable regulatory approach in most countries. Besides, when consumer demand is significant enough, people often find a way to enjoy a banned product and risk the consequences. Once

[15] These coding issues have resulted in new possibilities for the sector as ideological differences among the participants in a cryptocurrency network have caused them to react differently to code exploitations. Some participants remain in the same network after the exploitation, regardless of the results of the exploit, while others may decide to split ("fork") the network and take different actions in the network relative to the exploit. This is similar to other open source software movements over the decades.

enough people are flouting a law – as happened with the U.S. prohibition of alcohol in the early 1900s – injunctions become less effective and punishments harder to administer.

Indeed, the growing use of cryptocurrencies raises questions about whether they could proliferate more quickly than previous alternative currencies have been able. In the Internet era, the rapid adoption of technologies has frequently outstripped the ability of regulators or affected industries to control them, at least at first. For example, the Recording Industry Association of America (RIAA) had to resort to lawsuits to stamp out music downloads, reaping negative publicity for suing deceased grandmothers and 30,000 other "John/Jane Does" (Electronic Frontier Foundation, 2008). Other examples of rapid adoptions and disruptions despite private- or public-sector efforts to curtail them abound: eBay and Craigslist supplanting classified ads and newspaper revenue; online retailers and consumers avoiding sales taxes; self-publishing via blogs or social media circumventing efforts by established media companies to reduce the use of their content; and ride- and residence-sharing (via companies like Uber or Airbnb) that exploit regulatory and economic inefficiencies in those markets.

Eventually, governments and industries are often able to use these technologies for their own benefit in important ways, even if they can attempt to block them, but these incumbents' after-the-fact policymaking is actually dictated by the early adopters' motivations. Thus, it is important to discover them as soon as possible. For instance, after the music industry updated its distribution models, customers embraced the purchasing of music online; online retailers pay sales taxes now; Uber and Airbnb have become subject to taxes and have taken some steps to self-regulate in response to public pressure. Nevertheless, in all these cases, the new technologies could not be entirely stopped by government or industry policy due to strong consumer demand to use them. Given how similar peer-to-peer technologies have disrupted

established interests, could currency systems be subject to the same technologically driven, mass adoption forces seeking non-state cryptocurrency systems?

This research answered this question by measuring the adoption of Bitcoin and cryptocurrency systems and assessing what factors might explain trends in their perceptions and usage. To be sure, the effort to do so is a challenge because measures of the two main properties of any currency – being a store of value and medium of exchange – are just beginning to be developed for Bitcoin and cryptocurrencies. Nevertheless, it is revealing that the financial industry itself is acting with the expectation that Bitcoin and cryptocurrencies will continue to grow, by trying to restrain them or out-pace them. Additionally, entrenched financial companies are beginning to adopt cryptocurrency technologies for their internal systems and customer offerings to compete with "fintech startups" that are building a customer base with native cryptocurrency technologies. Also, a growing list of central banks and inter-bank NGOs around the world are evaluating their ability to convert to digital currency system(s) of their own or of mutual creation for a range of financial transaction purposes.

Theories to explain currency creation, adoption, and usage

There has been limited research on currency use and adoption at the individual user level. An oft-repeated maxim in the macroeconomic world is that bad money replaces good money, known as "Gresham's Law," which assesses macro-level individual currency use. The theory is that new political-economic forces debase commodity currencies, causing users to hoard higher value (good) money and exchange or use lower value (debased or bad) money, which, eventually, takes the good money out of circulation, as well as central-bank coffers (Galbraith, 1975; Selgin, 2019), and there are numerous historical examples of this. However, it is contradictory to theorize that the more valuable something is the less it is used, thus driving up

scarcity, because why would a currency that can increase in value get used?[16] As for non-national, community currencies, Pfajfar, et al. (2012) attempted to predict public interest in local community complementary currency systems (of the time-bank and economic development variety, discussed below) across 76 countries, using a series of fundamental economic indicators as explanatory variables.

They hypothesized that complementary currencies were either substitutes for fiat or complementary to fiat and thus focused on currency systems' existence as a proxy for the underlying effects of the currency system's use. Their results indicated a positive correlation of the number of complementary currency systems in a country to the country's overall monetary stability and economic development. Their research was an interesting first step at identifying transnational indicators of currency system viability; however, the dependent variable they chose was not rigorous (existence of complementary currencies systems as voluntarily reported to an ad hoc field database) and did not look at specific aspects of the *users* of the potential alternative currency systems. For example, assessing the societal attitudes and perspectives of the individuals who have chosen to use the currency as a dependent variable could be much more valuable to understanding the viability than whether a system exists.

Recent studies of the creation and adoption of fiat currencies have focused on the euro (EUR), a currency system that now spans multiple nations and cultures, mostly in Western Europe. The euro was researched and planned as a new central currency system using the Optimal Currency Area (OCA) theory. OCA considers the transaction costs within an economic

[16] This is a growing paradox among holders of Bitcoin and cryptocurrency (HODLers as they are called because an errant typographic error some years ago misspelled HOLD and created the acronym of Hold on for Dear Life as the price of Bitcoin experienced volatility, Gresham's Law in reverse) who realize if they spend it to increase usage and adoption they may miss increases in its value as a scarce resource currency.

area to determine how far a single currency should extend based on the efficient and optimal allocation of macroeconomic metrics (Ricci, 1997). Using macroeconomic indicators and monetary theory-based controls like inflationary biases, economic shock disparities, and relative firm labor mobility, central banks attempt to forecast the blending or "currency substitution" of an existing currency in favor of a foreign currency that may or may not benefit the users of the currency more than the operators of the currency (i.e., central banks and the private banks they support).

However, OCA is limited in that its approach is strictly macroeconomic and well-removed from the ground level of considering what the public wants or would accept. Not surprisingly, the debate over the euro's legitimacy, while seemingly settled at the OCA level, still rages at the political level (European Commission, 2018b). Political and economic upheavals – particularly, Greece's tumultuous fiscal issues and the United Kingdom's prolonged exit from the EU – have shaken faith in the euro in many European countries (Müller, Porcaro, & von Nordheim, 2018). Occasions when state money "breaks down" – such as recent demonetization events in India, Venezuela, and Sweden – raise similar questions within the public sphere about the need to rely on fiat currencies at all. OCA does not account for these possibilities because it explains the dissemination of a new currency based on macroeconomic factors, not according to what might be ideal for microeconomic or sub-national social needs – simply put, what individuals think is a good value.

A similar comparative analysis of multiple currency systems was done by Aschheim and Park (1976) in their review of post-Bretton Woods emergent currency systems. They defined a generic typology of the Artificial Currency Unit (ACU) that would proliferate in a post-gold standard global economy because currencies had actually become decoupled from any

universality. Currencies would devolve from merely in-country variants of a universal standard (typically gold) to become distinctive political constructs in each country. Where gold had been *the* standard and national currencies were mathematical proxies for it, without the backing of gold for global currencies, each currency became its own in-country socio-economic measure, self-defined by that country, and recent evidence suggests they have bordered on the experimental, with countries like Venezuela, Argentina, and Greece experiencing significant monetary policy challenges. Thus, national currencies were now merely political creatures that took on a life of their own, ergo, artificial currencies. Aschheim and Park's ACU theory is an interesting socio-economic by-product of moving off the gold standard and gives significant legitimacy to arguments that currencies are social constructs – that can vary from country to country – and not merely universal equivalents.

Meanwhile, the emergence of cryptocurrencies has presented the public with a new generation of alternative currencies from which to potentially choose. These currencies do not necessarily need to supplant existing fiat money for their usage to become widespread, in many ways an ACU but available globally, and their coexistence with all existing types of currencies brings new challenges for how to reconcile the field. The work of Cohen (2015) is useful here to understand the ways that multiple currencies can be used concurrently. As illustrated in Figure 3, Cohen proposes a currency pyramid of world currency systems. He categorizes various currencies based on how widespread an appeal they have, ultimately ranking them from top to bottom in this way: the U.S. dollar is the top currency; below that are cross-border "patrician" currencies like the euro and yen; then "elite" currencies like British pound and Swiss franc; "plebian currencies" are only used domestically; and "permeate" and "quasi" currencies are systems that have widespread use within lower socio-economic strata countries disproportionate

to the overall strength of the system; they are organically and reflexively used because there is no alternative for those populations.

Where a country's currency type is located in the pyramid is based on its "economic size, financial development, foreign policy ties, and military reach – together with market range and inertia" (Subacchi, 2016). These aspects of Cohen's currency pyramid are well aligned to be collected and compared with trends in Bitcoin and cryptocurrency use. As discussed below, variables integrated from these theories include a country's population demographics, socio-economic development, democratic institutional strength, and geographic identifiers. One of Cohen's primary findings is that lower levels of currency are actually viable and preferred by the public of certain countries, while those same citizens may transact in higher-level currencies for narrow forms of economic activity. For instance, some permeated currencies are used as an everyday medium of exchange and no one saves them (keeps their savings in them), while upper-

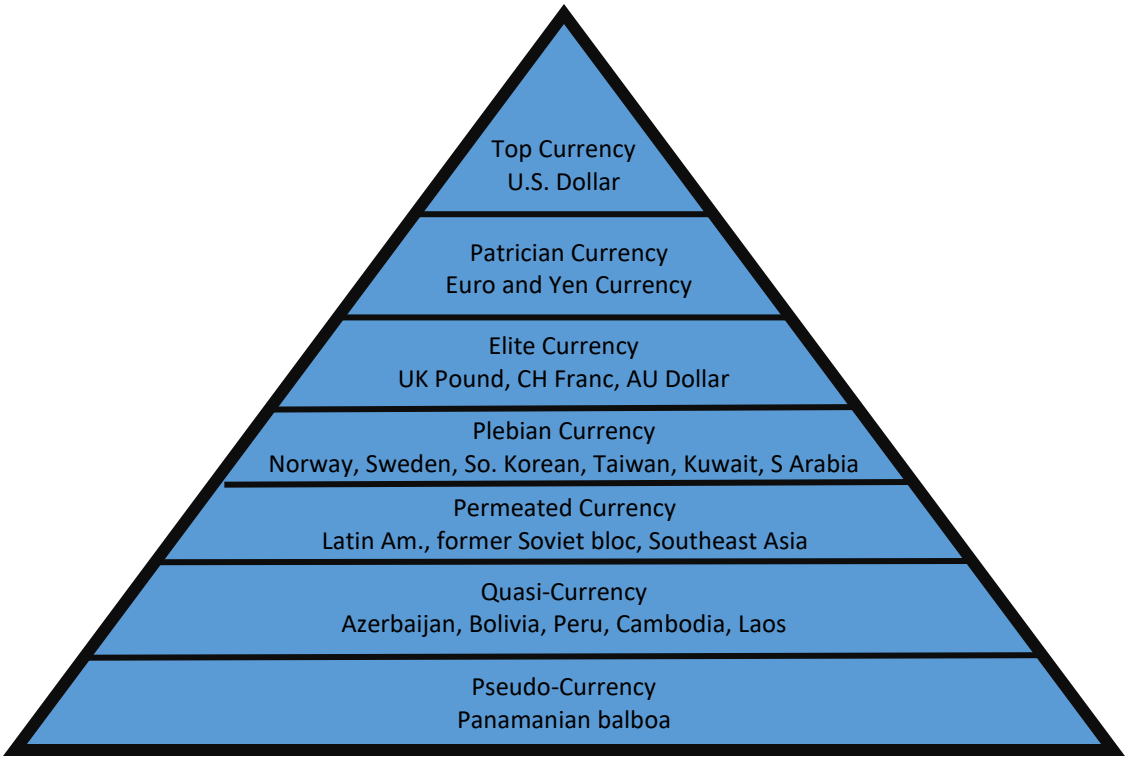

Figure 3. Cohen's Currency Pyramid

level currency types may be used as a medium of exchange but are also used as a functional store of value because they are considered to be bankable (users also keep their long-term savings in these currencies); the Chinese yuan and renminbi are examples of this. While these currencies are all state fiat currencies, their widespread use and coexistence within particular countries reinforce the complexities of currency systems and challenge the perspectives of currency theories like OCA, which imply that the adoption of a single "universal equivalent" is essentially inevitable. While conventional monetary and currency studies consider central bank and inter-bank currencies as evolved "universal equivalents" and interstitial lubricants across different national settings, there are a growing number of non-national currencies – and many that have never gone away – that users can and do choose for a variety of socio-economic needs. This includes the object of this research, Bitcoin and cryptocurrencies, that are neither explained *nor predicted* by those traditional theories.

An alternative theory: trust and control

A deeper inquiry into how we perceive and why we use currency systems requires us to involve and take seriously the role of trust because it is a significant aspect of any socio-economic interaction, and notably missing from macro-economic monetary theory. Trust has two components, the trusted entity – which has varying amounts of trustworthiness – and the trust extended by another party in a relationship with that trusted entity. Trust is a cornerstone of currency systems and a complex interplay between the users of the system and any given user's perception of the system itself – a system that could represent at least the two main functions of money (a medium of exchange and a store of value), if not many more.

Of particular utility for examining currency systems and trust are behavioral scientific approaches involving game theory and bounded rationality, which have challenged the rational-

actor models of economic behavior that are the explicit or implicit basis for theories of currency systems as a universal equivalent. These rational-actor models presume individuals can know all possible inputs and outputs of economic transactions and act in an objective manner based on that understanding. In behavioral science, notions of trust and risk are captured in the "trust game," which covers a range of anthropologic trust scenarios (Gintis, 2009). Participants are given a small sum of money to exchange with other participants through mutual judgments of altruism and personal gain (Berg, et al., 1995). This mirrors economic value exchange from prehistoric barter to contemporary social entrepreneurship endeavors – much like the landscape of extant of modern currency systems. What becomes clear in these trust games is that actors cannot know all rational inputs and outputs and instead use personal judgments, privileging the factors they do know, which have eroded the main thrust of "rational agent" economic models. From these studies and similar research, scholars have developed theories of bounded rationality that, I argue, challenge orthodox universal-equivalent views of currencies. Because no one actor (or monetary theorist or political economist) can know all economic factors at work in a transaction, neither can a national currency (nor certainly multiple national currencies) account for individual economic value prioritization. In other words, a universal-equivalent theory of money cannot account for the complexities of trust as it operates in the real world to determine individual attitudes and behaviors relating to currency use. If bounded rationality is accurate and true then the universal equivalent theory of currency cannot successfully describe currency systems or underpin monetary theory and political economics.

Other research in behavioral science underscores the role that trust plays in making money "work." As Francis Fukuyama (1995) suggests, the levels of generalized trust that individuals have in people outside of one's family can predict how economically successful a

society may become. He asserts a level of "social capital" accrues in high-trust societies that explains their citizens' overall economic prosperity while low-trust societies need relatively more governmental intervention – control – to mitigate deficiencies in non-familial trust relationships. Daniel Kahneman (2002) posits individuals make decisions based on either intuition or deliberation – what he terms "System 1" and "System 2" thinking. Kahneman uses the image below (the left-hand portion of Figure 3) to illustrate these two approaches.

Figure 3. Expressions of Intuition and Deliberation in Meaning versus in Economic Value

On the left side of Figure 3, the center symbol in each row can represent either the letter B or the number 13 depending on the intuitive context or rules of its placement, which shows how human cognition can use the exact same symbol for different intuited or deliberated conclusions. If each of those center symbols stood alone, the viewer would take an intuitive approach to determine its meaning and trust their intuition. However, in a context of other information (the additional inscriptions on either side, the "A"/"C" or the "12"/"14"), the rules for how to interpret the center inscription become clear, it is either a "B" or a "13." Similarly, in the case of socio-economic value, I propose that a diamond (as on the right side of Figure 3) has a similar intuition/deliberation duality. This diamond, standing by itself, conjures intuitive thoughts of its value, how big is it, what is its cut, color, and clarity? However, upon further consideration of more deliberative details and in differing social contexts, other indications of

value emerge. One might wonder what the rules and control regimes are of the diamond's existence: is it synthetic, ethically-sourced, or even authentic? The social constructs of the provenance of a diamond can range from it being lab-grown (which are actually more perfect than Earth-mined, but less valuable), sourced under forced labor or stolen (blood diamonds are perceived to have less value), loose or previously-set (how the marriage ended for the previously set diamond's owners can affect its current perceived value), or is it actually cubic zirconia and a fraudulent "diamond"?

Now, instead of a diamond, consider a person's reaction to a Russian ruble and a euro – how might perceptions of the value of those two currencies differ, even if the amounts might buy the same goods and services in any given country? How would individuals perceive a 500-rupee or 1000-rupee note, which India invalidated in 2016 (Economist, 2016), or any Venezuelan currency note, which the state initially invalidated at the end of that same year but later re-validated because of backlash (Guardian, 2016)? In this last scenario, what is an old note worth, and what is a new note worth – and to whom? These understandings of value depend on the social-political context and the intuitive and deliberative associations that individuals within those contexts make.

Kahneman (2002) suggests his System 2, deliberative cognition, is "relatively flexible and potentially rule-governed" – a *control* regime – while individuals *trust* their System 1 – intuitive cognition – based on a variety of mental cues accumulated from associative and emotional inputs, risks, and rewards. These are markers of when trust can be formed or realized, and definitely when it is needed. When trust is not needed, a rule-based system prevails. In further explicating intuitive thought, Kahneman uses variations of the trust game discussed above to consider various scenarios where actors may contradict reasoned economic preferences

in favor of heuristics and affective reasoning. The actor arrives at a subjective value based on sliding scales of System 1 and System 2 thinking – that is, *sliding scales of reliance on trust and rules* – to assign an economic value.

More to the point, I argue, the difference between the intuitive value of a currency and its deliberative value is the difference between the amount of trust or amount of control inherent in the currency system and the political and cultural contexts that underpin it, relative to the *individual*, not relative to a *universal standard*. The perceptions of this difference are predicted on an individual users' trust and control tolerances, motivations, and risk thresholds, which are not converging across society and may be diverging. These perceptions are not assigned, as is typically assumed in monetary theory-based policy circles, based on individual calculations of face value, purchasing power, inflation, and other macro-economic indicators, those are only superficial aspects of the debate and convenient mathematics. They are assigned based on a deeper human perception and cognitive assessment that underlies these perceived value assignments and that induces individual behavior. However, an understanding of how currency system users make intuitive and deliberative judgments about the currency and that translates to the real-world of monetary and currency theory and currency is missing from the literature.

But, extending the existing behavioral science research, Bart Nooteboom (2002) examines how trust explains (and drives down) transaction costs in all their incarnations: between individuals, between firms, and among and between individuals and organizations. Nooteboom rejects the idea that transaction costs can be solely attributed to self-interest, as it fails to account for altruism (trusting in a greater good), among other concepts.[17] Nevertheless, Nooteboom suggests that unchecked trust – trust that is granted easily and unexamined for

[17] Kahneman's "economic preferences" or even Adam Smith's "self-interest" and "Invisible Hand"

proportion and reciprocity between the two parties – is "unlikely to survive in markets"; in his view, trust alone is an insufficient tool for regulating economic activity because it is vulnerable to abuse by the trusted, whether by lack of "appropriate information, mutuality of influence, encouragement of self-control" or onerous bureaucratic processes. To this end, Nooteboom formally introduces the idea of governance and authority, and refers to those concepts simply as control, as a means of perfecting trust in economic activity and relationship building. He explores this possibility through his research into the nature and details of a specific type of control mechanism, written contracts. These can take the form of varying contractual possibilities ("communication elements") that capture trusting parties' expectations and provide the means to enumerate and enforce trust in a commercial transaction – primarily, through explicit and lengthy terms. These control technologies can be refined over time. Indeed, the Internet, Nooteboom noted back in 2002, was developing improved control mechanisms for traditional commercial activities. In Nooteboom's theory, more contract terms present in a contract were a sign of less trust involved in the relationship, and less economic value was created overall.

The above discussion of trust from the perspectives of Fukuyama, Kahneman, and Nooteboom has repeatedly invoked limits or bounds on trust that can take the form of governance or other methods of authority and control. Nooteboom characterizes this controlling mechanism as Information and Communication Technology (ICT), but he does so without the

apparent use of a significant independent theory about control. Here I wish to introduce a theory of control that can complement Nooteboom and others' notions of trust (and ICT specifically).[18]

James R. Beniger (1989) describes the way in which the development of human life has required the constant and growing imposition of control – even from the very origins of life, in DNA, recalibrating information storage in cells. Beniger traces this thread through the Stone Age to the Industrial Age: it is in the 19th century, he says, when the rapid change from traditional, natural (often haphazard) information systems gave way to increasingly ordered and rational information systems. Citing Max Weber, Beniger points out that "the traditionalist attitude…had to be at least partly overcome in the Western World before the further development to the specifically modern type of rational capitalistic economy could take place" (ibid.). Traditional relationships, Beniger argues, were highly predicated on trust mechanisms. In the 19th century, however, relationships became more transactional, and the loss of trust meant that transaction costs rose. According to Beniger, modern control mechanisms rely on information management, feedback, and communication among social networks, with an increasing emphasis on bureaucratic systems, technological advances, and social structures. Beniger's view of control systems situates them broadly in society, which complements Nooteboom's perspective above where he analyzed tactical aspects of control mechanisms in contracts, correlating their existence with lower trust – and economic value. This is reminiscent of Fukuyama's (1992) examination of what social structures were needed for economic growth and development. In Fukuyama's view, democratic systems were the final state of highest

[18] Control is an abstract term but less so than the "slippery" (Nooteboom, 2002) concept of trust. Control can have negative connotations, but the majority of its uses are arguably neutral. In the trust game discussed above, recent research (Zak, 2017) has found that employees report they'd give up 20% of their salary for more control over how their role is executed. This is a stunning link between trust, control, and economic value. Thus, control has broad applications as being related to governance, administration, and influence.

economic potential, and traditional, individual-trust relationship structures were of less economic value. However, this contradicts Nooteboom's theories of trust and control, whereby higher economic value can be obtained without extensive control. Can there be economic value with varying degrees of trust and control? Are trust and control mutually exclusive, or do they coexist and correlate with different loci of value? The literature suggests people find value in a spectrum of trust and control, and there is no single formula for what all users of currency might perceive as valuable. As with the comparison above between the intuitive and deliberative perceptions of Kahneman's "B"/"13" inscription and my metaphor of the diamond, the same symbols are believed to have different values by individual users in different control contexts.

Addressing this literature to currency systems specifically, in the late 20th century, changes in international monetary theory upended hundreds of years of relatively calm currency system use (Galbraith, 1975). Pre-modern social networks of trust – like the ancient Greeks' resistance to the debasement of currency – were steadily replaced by modern systems of technology-mediated control – notably fractional reserve centralized banking – that defined and attempted to ensure economic value. Nevertheless, communities have continued to find value in forms of exchange other than fiat money – forms that vary in their degrees of trust and control. One way that the trust of smaller social networks has been recaptured, for instance, is through complementary currency systems, currency systems created at the community level to be used in conjunction with national currencies; complementary currency systems have grown by organic means throughout communities of interest in recent decades.

Examining the varied use of such complementary currency systems among different groups, Martignoni (2012) created several typological indicators for currency systems based on two axes: trust and currency-system purpose. Extending some of the work of Thomas Greco, he

settled on the purpose, basis of trust, creation principle, and circulation principle as the scales for rating community currencies. While his research was focused on complementary currency systems, this method was an instructive first step towards theorizing differences among broader socio-economic value systems and quantifying the systems under review. Because he is characterizing the latent reasons for the currency system to exist and the authoritative basis for the user to trust the issuer – implying the importance of the attitudes of the system's users – Martignoni's typology provides an important first step towards a universal characterization of all currency systems.

Larue (2020) created a conceptual framework for classifying currencies along the lines of official/alternative, participatory/non-participatory, and universal/bounded, yielding the matrix in Figure 4. Larue's matrix based on currency system characteristics is useful for comparing and contrasting systems, which can reveal relationships among them for exploring the field. However, this matrix does not provide an overall map of socio-economic qualities that lead to a currency type's creation and use.

Table 1. A comparison of different currencies

	Non-participatory	Participatory
Universal	Euro Dollar	Bitcoin
Bounded	Meal Vouchers Air Miles Carbon Currencies	LETS Local Currencies WIR

Figure 4. Larue's Classification of Currencies

Building upon the past research and literature I have described, I propose a matrix of trust and control as a socio-economic typology for mapping currency systems – historical, present,

and future systems – that can be used, in turn, to generate a research methodology to test these theories. Figure 5 is the proposed matrix for this research:

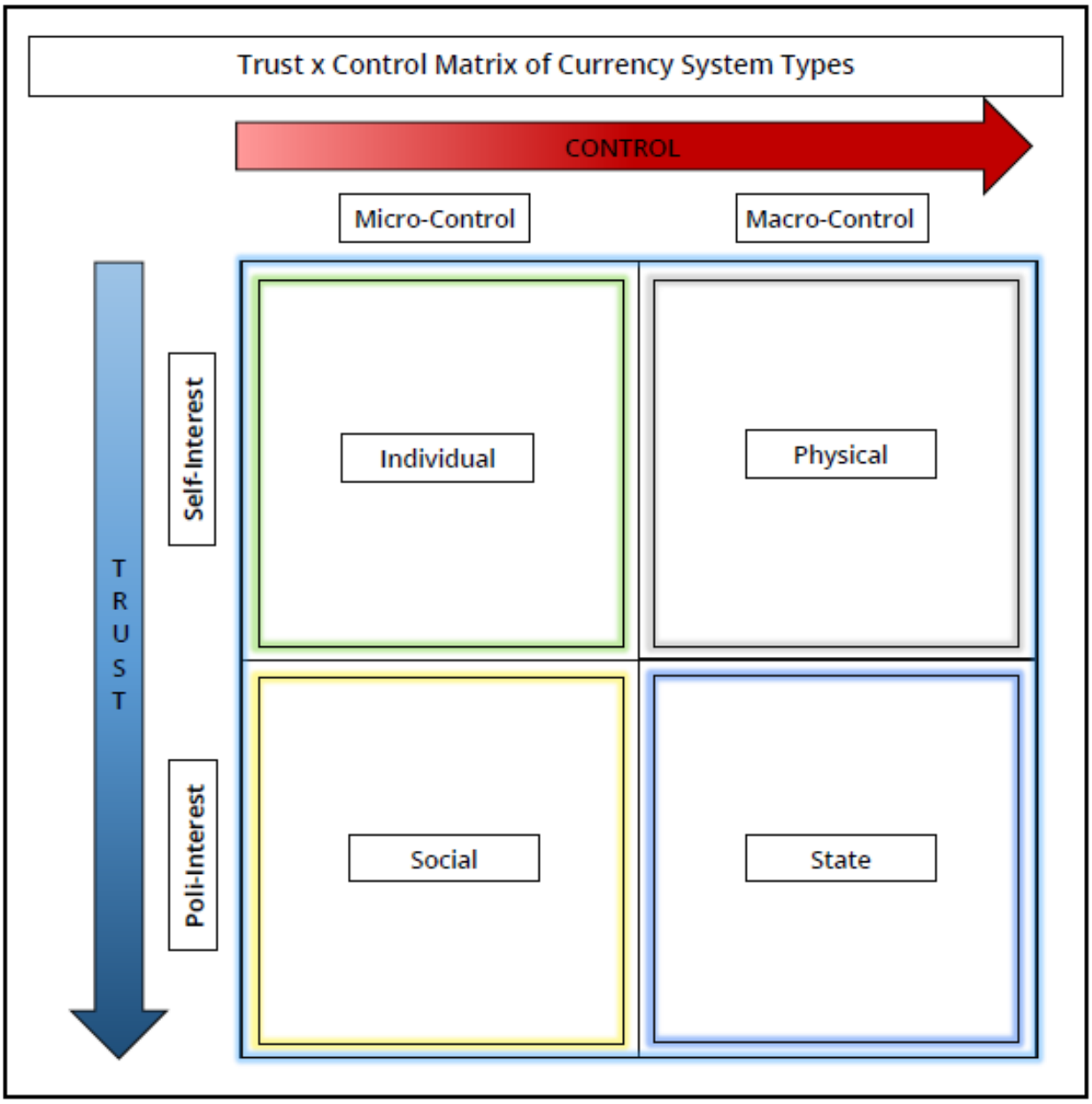

Figure 5. Trust and Control Matrix of Currency System Types

This theoretical matrix's axes are based on the three models discussed above (Nooteboom, Martignoni, and Pfajfar, et al.) and encompass the Venn diagram of the BIS

"money flower" taxonomy of money, but I have extended those examples and theories by employing a more complex understanding of overall socio-economic value and exchange that covers the entirety of existing currency systems from an individual user perspective. Chiefly, Nooteboom's conception of trust is retained as the y-axis and his conception of control as the x-axis; these two axes also correspond to the intuitive (trust) and deliberative (control) aspects of cognition that Kahneman theorized. New labels developed for this research represent the range of each axis: self-interest to poli-interest on the y-axis and micro-control to macro-control on the x-axis.[19] This 2 x 2 chart produces four broad types of currency systems: individual, physical, state, and social, and the details of each axes' range are variations and gradations of societal factors, suggested by the research of Martignoni, Pfajfar, et al., as discussed above. Each of these types of currency are further described below using examples of specific currency systems located in each of the quadrants defined by the trust and control axes. Each type is discussed below, and Figure 6 summarizes the preceding discussion and introduces examples of each currency type.

[19] Poli-interest is a collective term for the opposite of self-interest, the low end of the trust y-axis. Poli-interest includes concepts like sovereignty, community, and altruism.

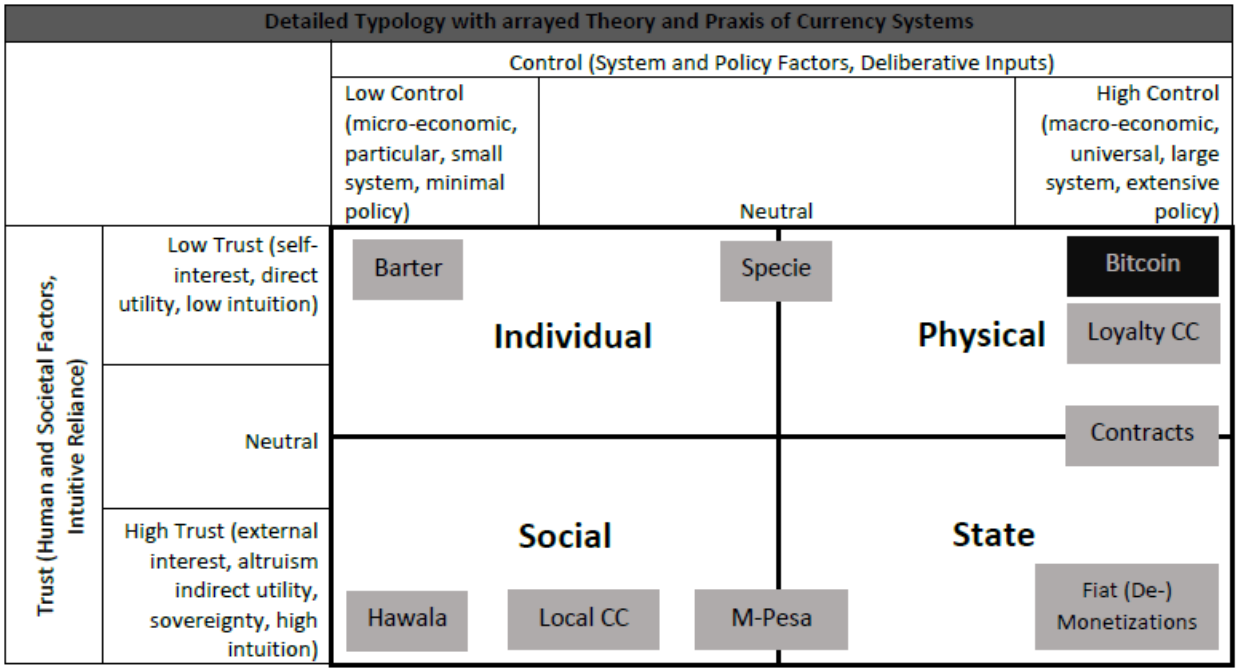

Figure 6. Detailed Typology with Arrayed Theory and Praxis of Currency Systems

Individual types of currency: low trust in systems and governments

The most basic form of any economic value and exchange system involves transactions that take place in a low-trust and low-control environment.[20] Users of these systems would do so out of a need for immediate transactions that are often one-to-one and not expected to repeat. There is very little cognition needed: users need not consider sophisticated value judgments of political interest nor extensive transaction systems to make a determination about whether the transaction is beneficial to them and to execute it. Individual currency systems fit best with the view that economic actors are rational agents, engaging in transactions in which both parties fully consider all the ramifications of each agreement. Individual currency systems like Cohen's permeate and plebian currencies or the Chinese renminbi are examples of this.

[20] Henceforth "economic value and exchange system" will just be referred to as a currency system that could include everything from barter to Bitcoin, for reference, see Figure 1.

Additionally, the most bare-bones of currency systems – one in which trust can be essentially absent – is barter. Barter in its purest form is the direct, instantaneous exchange of two items of value, often services for goods, but sometimes goods for goods. While barter has always been defined as a coincidence of wants, modern behavior as conducted on Freecycle.com or Craigslist.com (or previously via their now-defunct precursor: newspaper classified advertisements) could fit this description as well.

However, while traditional, smaller-scale societies with a dense network of interpersonal relations were able to use barter extensively for value exchange, the numerous shortcomings of this system made it difficult to use exclusively. The "coincidence of wants" that so typically describes barter can be severely limiting for members of a community that have deferred needs or a need to travel. In fact, anthropologists have recently asserted there never was a pure barter society (Dodd, 2014). Barter coexisted with proto-currency systems like gift economies that are highly subjective and personal to the actors in each transaction. Because of these limitations, different kinds of money arose to complement low-trust, low- control cashless systems like barter and gifting. These emergent systems increasingly were reliant on physical representations of the trust relationship between two trading partners.

Physical types of currency: increased technologic control of currency systems

While advances in information technology, cryptography, and distributed ledger technologies have led to the creation of the newest generation of what I call *physical* currencies, more basic technologies were used in the development of earlier forms.[21] For millennia,

[21] "Physical" is used here to refer not only to any literally physical substance or inanimate object, but also to structured types of currencies that are found or created and to which value is assigned. Thus, a rough gemstone, special crustacean shell, or even a cryptocurrency like Bitcoin based on complex mathematics share this quadrant of the trust and control matrix.

methods of harvesting nature (shells and commodity grains) or mining nature (rare metals or stones) have provided physical types of currencies. These systems are not replacements for barter, but systems of physical currency that arose initially from the utility value of commodity items like beaver pelts and foodstuffs used in exchanges.

Non-utility items, like precious metals and gems, would ultimately join those types of physical currency or shells and other immutable pieces of nature when functions like the store of value became more of a part of currency usage. People were attracted to a gold nugget or natural diamond as a store of value and a medium of exchange because they knew it was highly durable and hard to obtain in increasing quantity. The stones used as currency on the Island of Yap – each weighing hundreds of pounds – were also valuable for reasons that had little to do with their actual utility.[22] These stones were carved and mined as ornate but barely movable units of money; their value was in their immense physical qualities, and the technology and processes associated with mining and transporting the stones. These types of currencies shared an immutable nature and extensive technology and processes to create them that made them intrinsically valuable but of little utility.

Thus, the other key characteristic of physical types of currencies is the way that technological processes create them or bring them into existence. Specie currencies that were made from common commodity items like gold, silver, cowry shells, animal skins, or grains (Feingold, 2015) required specific technologies – rudimentary by today's standard, but high-tech

[22] These stones were transported and then left in place to serve their currency function. Indeed, anthropologist note, one stone fell off a boat in a lagoon during transport and was left in the lagoon to still serve its currency purpose for the users.

at the time – to create the currency and in many cases to use it.[23] More recent developments in currency creation continue this tradition of using technological advances to capture an immutable quantity for two parties to use as a currency. For example, cryptography and distributed ledger technologies allow digital currencies like Bitcoin to take on the quality of "digital gold," a technologically processed and immutable store of value and medium of exchange. In this sense, we can consider many cryptocurrencies to be "physical" currencies. Users of these systems do not have to invoke any trust mechanics or beliefs in other users or in any given transaction. The immutability of the medium involved in these physical types, cryptography especially, are rigorous and complex systems – highly ordered control structures and regimes – that require zero trust.

State types of currency: administrative control of currency systems

The purpose of sovereign currency systems was initially a combination of demonstrated technical prowess (originating with specie currencies, the ability to mine precious metal and then mint coins) and the desire to project a given head of state's political strength, predicated on the trust (voluntary or involuntary) granted by the users of the currency to the sovereign. The genesis of their adoption and use was through a mix of payment of sovereign employee salaries, payment to vendors and allies of the state for the procurement of state services, and forced remittance of taxes in the sovereign currency thus requiring subjects of the sovereign to accept the coin of the realm; citizens must use these currencies to do business within the political boundaries of the currency's use, which gives rise to the demand of the sovereign currency. This

[23]These ancient systems of specie currency transaction are low technology by today's standards but nonetheless process developments that bear the hallmarks of systems development and were high technology when first adopted as a currency. Mining natural substances was ever more difficult, and assaying or minting gold or silver was a highly technical process, some of which was embarked upon for speculative investment reasons, apart from the mere desire to use the items as a medium of exchange – similar to how Bitcoin was envisioned by Nakamoto.

is understood to be a large component of the genesis of a currency's value, but it can also have severe unintended consequences – for example, one of the original and most significant uses for sovereign currencies was to fund large public projects like wars, exploration, and colonization.

For many centuries, sovereign currency was minted from specie currency, but over time, minted specie gave way to paper note-based currencies with limited intrinsic or and no utility value (cf. Gresham's Law); in fact, to create intrinsic value they were minted or printed with significant iconography of the sovereign state even as their commodity value was decreased (debasement). In the extreme, this ushered in an era of fiat currencies, or currencies that were imposed by issuing governments, whose value was based on macroeconomic and political considerations far removed from the individual users' perceptions of the value of a transaction itself, or certainly the commodity or specie value of the currency. Innes (1913) and Knapp developed a full theory of "state money" that has persisted to this day. State money, in particular, requires an immense trust by the users of the system: trust in the currency's value and trust in the systems and processes of the governmental entity that issued the currency and accepts it in taxes for the provision of public services as well as extensive control regimes. These regimes create the circumstances for state currency's payment to large numbers of government employees, allied states, and forced remittances for taxes, and for the exercise of war and colonization. In modern times, colonization may have been replaced by globalization.

Social types of currency: a virtuous cycle of trust

Social types of currency are currency systems that seek to capture social values that state currencies fail to capture through traditional fiscal and monetary policy and the financial institutions that those policies enable. The hallmark of this type of currency system is a high degree of intuitive trust associated with the currency system's use and a strong belief in the

social purpose for which it was created, but a limited amount of actual control over its use and remittance. One early social currency, in use in the 1930s, was the Austrian Wörgl, which thrived as a local currency exchange for goods and services in the Austrian town of Wörgl within the context of a global depression that had severely devalued national currencies around the world.

However, perhaps the oldest social currency is a centuries-old system of financial settlement called hawala. While not necessarily a traditional currency in the sense of an identifiable single unit of account, hawala is a complex economic settlement process for transferring economic value over large distances and time, often across political and economic borders (Jost & Sandhu, 2003). Highly prevalent in Muslim countries and the Muslim diaspora, hawala is an unregulated financial system that relies on deep cultural trust (Qorchi, Wilson, & Maimbo, 2003) where a complete transaction utilizes various economic means and instruments over an extended time, sometimes months or years, for settlement. Some scholars argue that part of the reason this ancient financial settlement process works is that Muslim cultures see money as not an end in itself but rather a means to other social purposes (Irfan, 2015), which, in part, leads to a high degree of trust needed for the system to work. At the same time, it does not require or use a centralized authority or a formal system of control; hawala settlements occur organically, according to custom and through distributed economic transactions, over time.

Other currency systems of the social type include complementary currencies, described earlier. These currencies are specifically designed to spur local economic development, community building, and social value transfer in cities, towns, and regions. Though none of them has achieved widespread adoption, complementary currencies have attracted interest worldwide over the last several decades. Proponents of these currencies design these systems to

be based on local community economic needs that are not subject to central bank authority or political manipulation. These proponents criticize central bank monetary policy as privileging private-sector production and missing public-good creation. Society needs monetary systems that fully address society's monetary needs, they argue, and as complements to fiat currencies, these systems can provide a hedge against the unpredictable and negative effects of economic cycles (Lietaer & Dunne, 2013).

The critiques of fiat money posed by advocates of complementary currencies echo those of social theorists like Zelizer and Bandelj (2012), who contend that traditional economic theories of money (state systems as described above) lack community and social value and meaning. Indeed, they assert, rather than a universal equivalent model of socio-economic value, "developing a sociological model of multiple monies is part of a broader challenge to neo-classical economic theory" (Zelizer, 1989) because neo-classical economic theory has consistently ignored the existence of other currencies, which includes the range of complementary currencies. In particular, these theorists argue that fiat money fails to account for transactions relating to emotional labor and relational work, which could be better captured by community currencies because of community currencies' focus on the holistic socio-economic needs of society. Indeed, the goal of complementary currencies is to tangibly capture community value production (e.g., local artisans and local farmers, barter, volunteer work) and allow that captured value to be traded within the community by other producers and consumers of the social value.

Importantly, because these currencies cannot be used outside the community of their creation and exchange, there is no net loss of economic value from spending the currency elsewhere (remittances in a macro-economic sense, or as simple as buying goods on the internet

from another region and having them shipped in). These currencies are transmitted to and from other merchants and customers who value the community effort involved, providing more local benefit than the same commodity or produce purchased at a grocery store, which may be harvested outside the community, state, or even country. The complementary currency is then circulated among participating community merchants for goods and services. Further illustrating this difference is the belief that globalization and transnational currencies strengthen geopolitical ties, which has the unintended consequence of weakening local community ties.

Often these currencies are referred to as "time banks" and the "monetization of time" because there is a heavy bias towards time itself being the differentiator between a locally-produced good or service versus a foreign-produced good or service. Complementary currencies can also be used in place of national currencies to promote certain types of socially beneficial transactions. For example, complementary currencies could be used to compensate an ex-convict for doing community service that may have a national currency value of below minimum wage but that has a local currency value of more than minimum wage. The social benefit is two-fold, consisting of the real work done (e.g., collecting litter from a park) and the net addition of the complementary currency compensated labor to the local community from an otherwise difficult-to-employ-for-national-currency worker.

In Ithaca, New York, the first significant complementary currency system in the U.S. – the Ithaca HOURS – was created in 1991 (Glover, 2018). The Ithaca HOURS system connects local merchants and volunteer and community service organizations to facilitate the exchange of goods and services for community service hours spent by the participants. The chit a supporter earns is a piece of paper denominated in hours invested in the community. Similarly, the Piedmont area of North Carolina started a complementary currency system in 2001 called

PLENTY, which has helped economic development efforts by keeping economic activity locally circulating within participating merchants. Baltimore, Maryland, started a BNote in 2010, one of the more successful systems in the United States, which has encouraged recirculation of local resources and community economic interests. The UK and Western Europe have dozens of similar systems, and around the world, hundreds are serving to support intra-community trade in ways that, their proponents argue, national currency systems cannot (Seyfang & Longhurst, 2018).

Notably, complementary currencies foster economic growth while at the same time auguring greater awareness and acceptance of denationalized currencies and the promise they hold for economic security. These complementary currencies require a high degree of trust because they focus on communities of interest in ways that are not deliberatively measured – that is, there is no mathematical way to measure the strengthening of the social fabric of a community. The participants in the system are involved because of an interest in creating or participating in a system that is larger than the individual member; their interest is in the flourishing of the political community to which they belong, and this orientation requires substantial levels of altruism. However, these social currency systems do not require much in the way of control. They are essentially volunteer systems and are not, for instance, mandated for use to pay taxes or other obligatory political-economic behaviors.

Hypotheses

Drawing from the theory of trust and control described above, this study examined trust, control, and cultural factors that may account for why people have positive or negative perceptions or choose to use or avoid Bitcoin and cryptocurrencies. The research theory of trust and control implies that, for physical types of currency like Bitcoin, state policies will matter less

in explaining trends in usage and expressed approval, while economic development (which allows for widespread citizen usage of cryptocurrencies) and lack of citizen trust in government (which makes state-sponsored fiat currencies less attractive) will matter relatively more. Therefore, to test the matrix of *trust* and *control* and explore the basis for the perceptions and usage of Bitcoin and cryptocurrencies, the following hypotheses were constructed:

Control: public policy

H1a: Countries with more restrictive policies regarding the use of Bitcoin and cryptocurrencies will have more negative perceptions of Bitcoin and cryptocurrencies.

H1b: Countries with more restrictive policies regarding the use of Bitcoin and cryptocurrencies will have lower usage of Bitcoin and cryptocurrencies.

Culture: socio-economic development

H2a: Countries with more developed economies will have more positive perceptions of Bitcoin and cryptocurrencies.

H2b: Countries with more developed economies will have higher usage of Bitcoin and cryptocurrencies.

Trust: attitudes of trust in society and of government

H3a: Countries with lower levels of trust in society and government will have more positive perceptions of Bitcoin and cryptocurrencies.

H3b: Countries with lower levels of trust in society and government will have higher usage of Bitcoin and cryptocurrencies.

Hypotheses H1a and H1b were constructed based on general monetary theory-based premises and specifically on theories like the OCA and ACU, or Gresham's Law, that are predicated on the idea that individual user's behavior is purely rational and can be influenced by

public policy, or that public policy is designed and intended to have these types of effects. Testing for public policy control mechanisms' relationships to Bitcoin and cryptocurrency perceptions and usage also tests the theories of Kahneman and Nooteboom that promote the idea that levels of governance and authority are critical components to establishing socio-economic valuations through currencies. Two hypotheses were used to differentiate between the potential differences in perception versus use.

Hypotheses H2a and H2b were constructed based on Cohen's currency pyramid, which assumes theories of ACU are valid, and the theory that currency systems are differentiated by their underlying country of existence based on macro-economic metrics. In the case of Bitcoin and cryptocurrency, that might ultimately correspond to a trans-global community so this research and these hypotheses examined the perceptions and use per-country based on Cohen's theory per-country as a proxy for who might have higher perceptions and usage to these new global currencies. Testing these hypotheses will provide insight into the relationship of Bitcoin and cryptocurrency to other national currencies and as standalone currencies. As with H1, two H2 hypotheses were used to test for differences between perceptions and usage.

Finally, H3a and H3b were constructed based on overall trust questions – trust in others and trust in the government – as a basis for currency system perceptions and use. Fukuyama, Kahneman, and Nooteboom view trust as half of the differentiation of socio-economic value (the other half being control), so testing trust attitudes related to Bitcoin and cryptocurrency as discussed will provide a means to validate the overall trust and control matrix to effectively characterize currency systems. Again, two sub-hypotheses were created to consider differences between mere perceptions and actual use.

Methodology

Research variables and process model

This study involved a quantitative multivariate principal component analysis (PCA) of factors with ordinary least squares (OLS) regressions of possible policy, trust, and cultural factors driving the perceptions and usage of Bitcoin and cryptocurrency around the world. It also sought to assess which set of factors – levels of trust in society and government, socio-economic development, and state control over Bitcoin and cryptocurrencies – may have a greater influence on perceptions and usage based on the idea that currencies are both social and economic phenomena, social constructs not necessarily established by or reliant on the state. Figure 7 below depicts an initial conceptual process model of the variables.

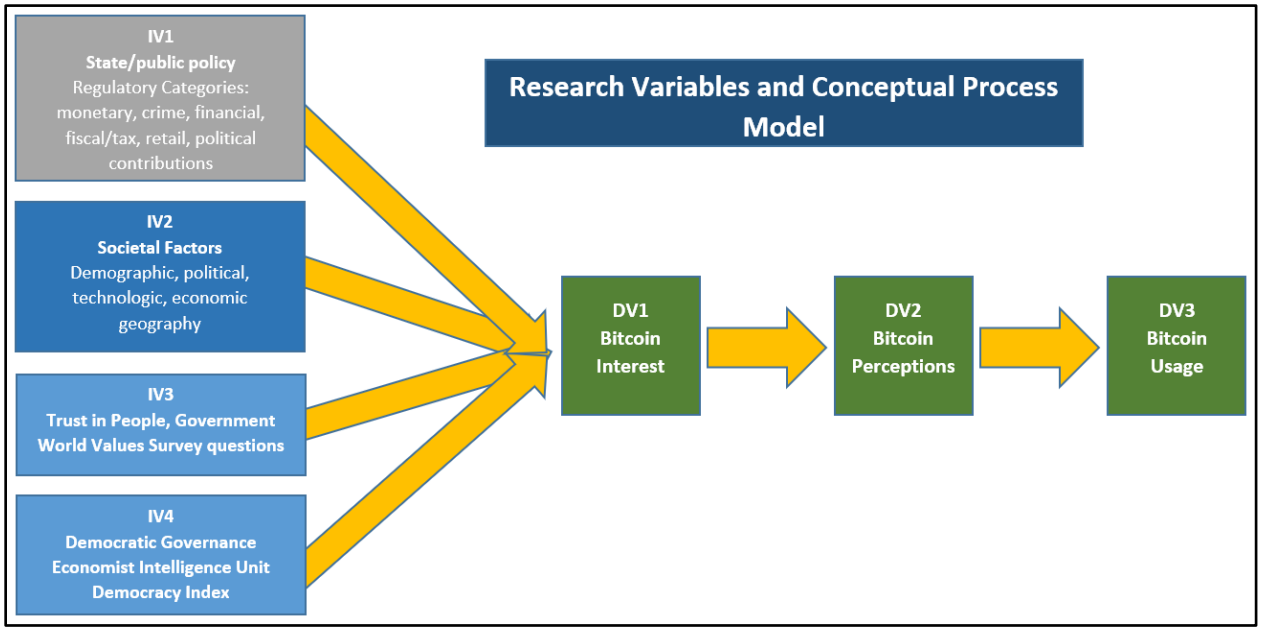

Figure 7. Research Variables and Conceptual Process Model

Dependent variable type #1 – perceptions of Bitcoin and cryptocurrencies

This variable measured personal perceptions of Bitcoin and cryptocurrency as a store of value or medium of exchange. To measure this, a dataset created by ING Group in 2018 (Exton,

2018) for their behavioral economics department's market research on personal financial and monetary issues was used. This research was conducted with a survey instrument generated in collaboration with Ipsos on behalf of ING Group and distributed through ING Group market channels by Ipsos. ING Group fielded the survey in the spring of 2018 across 15 countries and obtained approximately 1,000 responses per country in response to six questions measuring personal perceptions and usage of Bitcoin and cryptocurrencies. The total sample size was 14,828. A portion of the actual survey instrument related to the cryptocurrency questions listed below is included in Appendix A.

These measurements were analyzed individually with the goal of determining what might be a useful index for Bitcoin and cryptocurrency perception and usage as part of the analysis. In all cases, values were recorded or recoded to be higher for more favorable perception or higher usage of Bitcoin and cryptocurrency. The following measurements were used:

1. Have you ever heard of cryptocurrency? If so, do you own any? [three mutually exclusive optioned statements seeking a "Yes" or "No"]
    1. I have heard of cryptocurrency
    2. I own some cryptocurrency
    3. I expect to own cryptocurrency in the future

    Responses to these questions were recorded as "Yes" (1) or "No" (0), with an affirmative to each successive question considered to be more positive and increasing the favorability of the respondent's view of cryptocurrency. If the respondent answers "No" to the first question, the survey ends for the cryptocurrency section. The respondent could have answered "Yes" to owning cryptocurrency and then "No"

to expecting to own cryptocurrency, which would lower the overall positivity of the respondent's attitude.

2. Crypto-money or cryptocurrency is a kind of digital currency. This currency is not created nor secured by the government, but by a network of individuals. Bitcoin is the best-known example.

   Please indicate how much you agree or disagree with the following statements:

   1. "Digital currencies – such as Bitcoins – are the future of spending online"
   2. "Digital currencies – such as Bitcoins – are the future of investment as storage of value"
   3. "I think the value of digital currencies – such as Bitcoins – will increase in the next 12 months"

   Answers to these questions were recorded with Likert-style scalar values of: "Strongly agree" (5), "Agree" (4), "Neither agree nor disagree" (3), "Disagree" (2), and "Strongly disagree" (1). Responses of "I don't have an opinion" were treated as missing data. Higher recorded values for each question were considered a more positive perception of Bitcoin and cryptocurrency.

3. Cryptocurrencies are a type of asset. How would you compare the risk of owning cryptocurrency compared to the following alternative assets?

   Cash, Government bonds, Stock market investment, Real estate/property funds, Gold, Investing in your own business

   Answers to each type of asset were recorded with a Likert-style scalar from 1-5 corresponding to these options:

1. Much lower risk compared to holding cryptocurrency
2. Lower risk compared to holding cryptocurrency
3. About the same risk as holding cryptocurrency
4. Higher risk compared to holding cryptocurrency
5. Much higher risk compared to holding cryptocurrency

Higher recorded values for each question were considered a more positive perception of Bitcoin and cryptocurrency.

4. If you had money available (about 1 month's take-home/net pay) and you wanted some more information on cryptocurrency as a possible investment, where would you most likely get advice?
    1. I don't know
    2. I (would) never invest money in cryptocurrency
    3. An online computer program or algorithm that provides tailored advice
    4. The internet and specialist websites
    5. My friends/My family
    6. An independent financial advisor or bank advisor

    Higher recorded values for each question were considered a more positive perception of Bitcoin and cryptocurrency.
5. Would you use cryptocurrencies – such as Bitcoin – for the following activities if you had the option?
    1. Buy cup of coffee
    2. Receive your take-home pay
    3. Pay taxes

4. Pay your monthly electricity bill
5. Buy a plane fare
6. Make an international payment for a product you buy online
7. Save for your child's university fees

Responses to each of these activities were recorded as a binary "Yes"/"No" to each question, with only the first option for a "Yes" – "Yes" for the activity – being mutually exclusive from the rest. Respondents could say no for multiple reasons.

1. Yes
2. No, I don't want to change the way I pay
3. No, I think there would be too much risk
4. No, Bitcoin is interesting to me only as an investment

Dependent variable type #2 – usage of Bitcoin and cryptocurrencies

There are many ways to operationalize the dependent variable of Bitcoin and cryptocurrency usage. Usage can take many forms, some of which translate to traditional currency system uses despite the novelty of cryptocurrency. Metrics such as transaction volume, ATM (fiat/cryptocurrency conversion) distribution, and offline, local exchange provide measures similar to those employed to measure national currency use. But cryptocurrency also has usage metrics such as mining activity, fiat exchange rates, and location and number of cryptocurrency exchanges that are not shared by central bank currencies. The cryptocurrency distributed ledgers (blockchains) and growing network of websites that analyze the chains provide ample information about:

1. where nodes on the network reside
2. number of markets or exchanges in a country

3. the number of bitcoins produced by a given node
4. overall market capitalization of Bitcoin and cryptocurrency in a given country's national currency
5. transaction volume per country
6. calculated exchange rate of a unit of national currency to bitcoin
7. production of new bitcoins (mining)
8. interest in what Bitcoin is and learning about it
9. availability of digital currency and fiat holders to trade offline
10. availability of Bitcoin ATMs

As described below, the above measures were created as dependent variables measuring Bitcoin and cryptocurrency perceptions and usage. The following primary three measurements were used to measure this variable. These were selected as primary dependent usage variables because they relate directly to individual action to use Bitcoin and cryptocurrency (in this case these measures were specifically focused on Bitcoin) and therefore most closely represent the dimension of usage measured by the ING/Ipsos survey instrument discussed above. The rest were considered Other Metrics for exploratory consideration.

Interest in Bitcoin (BI)

For this measure, I reviewed the internet search trends in each country from Google Trends for the term "bitcoin." Before the citizens of a country can use a cryptocurrency, they must learn about them and how to participate and transact with them. The Google Trends reports, which began in 2004, have been widely used to analyze data on popular trends and interests. Google provides an Interest over Time measure that represents:

search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means there was not enough data for this term.

For this research, five years of search trends for the query term "bitcoin" [https://trends.google.com/trends/explore?date=today%205-y&q=bitcoin] were used. Based on Google's Internet over Time measure, I coded this variable as an integer from 0 to 100 for each country as of May 31, 2018.

Availability of Bitcoin ATMs (AB)

This variable measured the demand for access to Bitcoins as a medium of exchange for retail purposes. This variable was defined as the number of Bitcoin ATMs available in a given country and recorded as a whole number from coinatmradar.com as of May 31, 2018.

Bitcoin nodes (BN)

This variable was defined as the number of Bitcoin nodes per country measured by nodes.earn.com, the only aggregator of Bitcoin nodes. It was recorded as a whole number of nodes reachable as of May 31, 2018. This provided insight into a society's interest and capability in creating and running nodes on the Bitcoin network.

Other usage measures for Bitcoin and cryptocurrencies

The following metrics were also defined to provide context regarding the emergence of Bitcoin in the sample countries. There were limitations to their value in answering the study's research questions, however, because of the conflation of currency uses that underpin these metrics and the overall quality of these measurements to effectively measure the activity. For the completeness of this research, these metrics were defined to better understand the phenomena of

cryptocurrency and its novelty. They also were intended to be used to see if these measurements had any statistical value when analyzed with the other variables.

Offline exchange of Bitcoin (OB)

This variable measured the availability and interest in trading Bitcoin offline in exchange for other currencies. This variable was defined as the number of Bitcoins offered **for sale** in a given country via the peer-to-peer crypto exchange site localbitcoin.com, the only aggregator of international non-electronic cryptocurrency exchange.[24] It was recorded as a whole or decimal fraction of the number of coins per country as of May 31, 2018.

A second measurement was defined as the number of Bitcoins offered **to buy** in a given country via the peer-to-peer crypto exchange site localbitcoin.com, the only aggregator of international non-electronic cryptocurrency exchange. It was recorded as a whole or decimal fraction of the number of coins per country as of May 31, 2018.

Bitcoin investment (BI)

This variable was defined as the market capitalization of Bitcoin per country from cryptocompare.com, one of the top commercial aggregators of cryptocurrency data. It was recorded as a rounded number to the nearest million in USD as of May 31, 2018. This provided a sense of which nations have individuals who have chosen to use Bitcoins in addition to or in place of their national currencies.

Bitcoin transaction (BT)

This variable was defined as the transaction volume of Bitcoin per country from Blockchain.info. It was recorded as a whole number rounded to the nearest thousand as of May

[24] At the time of this research, localbitcoin.com was the only aggregator of international non-electronic cryptocurrency exchange. Since then Paxful has emerged as a similar service.

31, 2018. It was intended to measure which nations have a transactional (trading and purchasing) interest in Bitcoin.

Bitcoin fiat exchange (BF)

This variable was defined as the exchange rate for Bitcoin to the national currency on the Coinmarketcap.com website. It was recorded as a whole number of the cryptocurrency exchange market rate for Bitcoin in each country's currency and converted to USD based on market figures and exchange rate data from the U.S Federal Reserve weekly foreign exchange rates for the week ending June 2, 2018.[25] This measured the relative strength of a given nation's current unit of currency in relation to Bitcoin.

Bitcoin creation (BC)

This variable was defined as coin production per country from Blockchain.info, one of the longest-standing, open-source blockchain viewers for the Bitcoin digital currency. It was recorded as the number of coins or fractions thereof for the 31-day period ending on May 31, 2018. It measured individuals' willingness and ability to devote resources to the production and creation of Bitcoin (mining).

Bitcoin markets (BM)

This variable was defined as the number of in-country cryptocurrency exchanges, as measured by Coinmarketcap.com, the largest aggregator of cryptocurrency markets and exchange data. It was recorded as a whole number as of May 31, 2018. It measured the number of markets/exchanges that have been set up to purchase or exchange cryptocurrencies.

[25] https://www.federalreserve.gov/releases/h10/default.htm

Post-data collection removal of these measurements

After further review and attempts to collect these Other Metrics during the latter months of 2018 and early 2019, these Other Metrics, while already speculative in early phases of the research have, over time, become even less tenuous as reliable and valid metrics to collect and on which to base any – even exploratory – analysis. In consequence, they could not be fully and reliably collected so were neither completed for this research nor were they included in any results or analysis.

It is instructive that these potentially reasonable measures of Bitcoin and cryptocurrency, measurements that are endemic of typical monetary theory-based approaches, are probably not viable measurements of Bitcoin and cryptocurrencies. This is both a confounding symptom and by-product of the nature of these forms of currency relative to traditional currencies.

Independent variable type #1 – public policy

This set of variables provided insight into whether and how particular public policies regulate the usage of Bitcoin and cryptocurrencies and thereby shape or were shaped by public attitudes toward them. Given the difficulty of regulating such virtual transactions, however, the extent to which policy can affect perception and usage was unclear. Of the measurement variables collected for this research, public policy factors are the most complicated to determine and measure. While the obscurity of cryptocurrency use is a challenge, public policy metrics are more so because there are myriad types of policies related to any of the numerous traits of cryptocurrency use. Related to that, public institutions each have different aspects they regulate, and each country can have clear, vague, or nuanced positions – intentionally or not – on each of these factors. Indeed, even the varying legislative and executive bodies in the same country can have differing or opposing views on any given matter – and change those views monthly.

However, what has emerged in recent years is a growing amount of industry and journalistic attention to the quickly changing regulatory environment. For this research, two useful rubrics were reviewed from recent non-academic efforts to describe and assess relevant public policies. The first is from a website called Coin Dance (Blockchain Ventures, 2018), which has been operating for several years in the sector. Coin Dance's primary information dissemination is related to the sorts of cryptocurrency statistics described in the variables above (ATMs, nodes). Additionally, it also has a long-standing chart of 246 countries and regions that tracks in-country Bitcoin and cryptocurrency regulatory support and 16 countries' political party and candidate support of Bitcoin and cryptocurrency. While the data itself in this site (generated mostly by user submission) was not considered authoritative, the manner in which the policy positions were tracked was useful to build a variable for this research.

In addition to Coin Dance, Bloomberg Quint (a partnership with U.S.-based Bloomberg News and India-based Quintillion Media) recently created a matrix of 22 countries' public policy positions on a range of cryptocurrency regulatory matters (Bloomberg News, 2018). The Bloomberg Quint matrix is more complete in policy positions and the number of countries reviewed than previous publicly released industry or journalistic attempts to measure digital currency regulations; it is also from a well-respected business news organization. However, like the Coin Dance policy chart, it was only used for a model of how to collect policy positions and was not considered authoritative data itself.

To executed my measurement of the national policy environments for Bitcoin and cryptocurrencies, I created a matrix that integrated aspects of the Coin Dance regulatory tracking model with the Bloomberg Quint reporting model and then sought authoritative data to populate the final matrix. The policy variables described below were constructed to provide higher values

when the policy is more favorable to digital currency and lower values when the policy is less favorable. Therefore, the aggregate index of these policy measurements will be higher when a country is more supportive of Bitcoin and cryptocurrency and lower when a country is less supportive of Bitcoin and cryptocurrency. I developed the following variables:

- Bitcoin and cryptocurrency legality – a measure of the relative legality of Bitcoin and cryptocurrency in the sample country
    - Ordinal classification as: Illegal, Restricted, Neutral, Legal
    - Modified Likert-style measurement recorded as an integer from 0-3
    - A country with no public regulatory positions on Bitcoin and cryptocurrency was coded as missing data
- Bitcoin and cryptocurrency classification policy – a measure of which property of currency the sample country considers Bitcoin and cryptocurrency to be
    - Ordinal classification as: No Position, Barter/Good, Commodity, Property, Currency/Money
    - Modified Likert-style measurement recorded as an integer from 0-4
    - These classifications are broadly defined along a spectrum of an asset versus a security and are common types that follow the U.S. Securities and Exchanges' "Howey Test"
- Cryptocurrency exchange – a measure of the regulatory environment for cryptocurrency exchanges
    - Ordinal classification as: Illegal, Restricted, Neutral, Legal
    - Modified Likert-style measurement recorded as an integer from 0-3

    - A country with no public regulatory position on this issue was coded as "missing data"
- Initial coin offering – a measure of whether ICOs are permitted to be offered in the country
    - Ordinal classification as: Illegal, Restricted, Neutral, Legal
    - Modified Likert-style measurement recorded as an integer from 0-3
    - A country with no public regulatory position on this issue was coded as "missing data"
- Bitcoin and cryptocurrency political support – a measure of the number of political entities openly supporting/accepting Bitcoin and cryptocurrency
    - Types of entities could include: Political Party, Candidate, Officeholder, Other
    - Measurement recorded as an integer from 0-n based on the quantities of entities which support or accept Bitcoin and cryptocurrencies
    - This measurement was recorded from the website CoinDance.com, the only aggregator of such data
- Cryptocurrency payments – a measure of whether cryptocurrency payments are permitted in-country
    - Binary classification as: "No" (0) or "Yes" (1)
- Fiat conversion – a measure of whether Bitcoin and cryptocurrency can be bought with the national currency
    - Binary classification as: "No" (0) or "Yes" (1)

- Planned legislation or regulation – a measure of whether Bitcoin and cryptocurrency public policy has been identified as a research topic for any formal body of the government
    - Binary classification as: "No" (0) or "Yes" (1)
- Bitcoin and cryptocurrency warning – a measure of whether public policy arbiters have issued warnings about Bitcoin and cryptocurrency use
    - Binary classification as: "No" (0) or "Yes" (1)

Four authoritative sources of national policy positions were used to measure these metrics, as follows:

1. Regulation of Cryptocurrency Around the World, Library of Congress – Law Section, June 2018 https://www.loc.gov/law/help/cryptocurrency/world-survey.php
2. Regulation of Bitcoin in Selected Jurisdictions, Library of Congress – Law Section, January 2014 https://www.loc.gov/law/help/bitcoin-survey/index.php
3. Is Bitcoin Legal?, CoinDesk, July 2018 https://www.coindesk.com/information/is-bitcoin-legal
4. For the political parties and politician count, the Coin Dance – Politics & Opinion – Global Bitcoin Political Support & Public Opinion page was reviewed; https://coin.dance/poli [retrieved 9/29/2019]

Independent variable type #2 – socio-economics and culture

Independent variable type #2's societal factors were derived from Cohen's currency pyramid theory of currency system types and their related host countries. Cohen's theory

describes a range of usage of national currency types within each country based on societal factors within that country. Inspired by this approach, I used the following societal factors:

- Economic
    a. Gross Domestic Product (GDP) – a measure of the GDP of the sample country based on World Bank data, recorded as a number rounded to the nearest billion as of 2018.
    b. Gini coefficient of inequality – a measure of the distribution of wealth in the country as of 2018 as collected by World Bank, recorded as a decimal number from 0.0 to 1.0 for the year 2018.
    c. Remittance volume – a measure of the volume of remittances to the country as collected by World Bank, recorded as an integer rounded to the nearest ten million for May 2018.
- Technological
    a. Internet Freedom – a measure of the degree of digital or technologic freedom present within in the country from the Freedom House Internet Freedom (FHIF) ranking for the sample country, recorded as a whole number for the most recent year available (a mix of 2018 and 2019 based on availability from secondary sources) of both composite index and categorical values.
    b. Broadband adoption – a measure of the number of subscribers to broadband internet throughout the sample country as collected by the International Telecommunication Union World Telecommunication/ICT Development for Fixed Broadband in total and percentage of the population for the most recent year available.

c. Internet spending – a measure of the amount of economic activity that is done on the internet in the sample country. This measurement indicates the level of adoption and comfort with activities on the internet as collected by the United Nations Conference on Trade and Development in the B2C E-commerce Index 2018.

d. Mobile phone ownership – a measure of the number of mobile phones in use per 100 people within the sample country as collected by the International Telecommunication Union, World Telecommunication/ICT Development for Mobile Cellular (broadband) in total and as a percentage of the population for the most recent year available.

e. Energy (electricity) cost per kWh – this measurement variable will be obtained from the IEA for OECD Countries, Energy Prices and Taxes, 3rd Quarter 2019 (for 2018 metrics); non-OECD Countries, World Energy Prices, 2019 (for 2018 metrics), recorded for residential and commercial rates.

- Human development

a. United Nations Development Program Human Development Index (UNDP HDI) – a measure of the level of development of the sample country, recorded as a whole number index value for the most recent year available.

b. Educational level – a measure of the percentage of the population with a college degree in the sample country based on OECD data, recorded as a number rounded to the nearest tenth of a percent as of 2018.

c. Happiness – a measure of the amount of reported happiness in the sample country as collected by the United Nations Sustainable Development

Solutions Network (UNSDSN), recorded as an integer for the most recent year available.

d. Crime (major/violent) – a measure of the amount of major/violent crime per 100,000 people of the sample country based on the number of homicides per 100,000 people in the sample country as collected by the OECD in the Better Life Index, recorded as a number rounded to the nearest tenth as of 2018.
e. Feel safe walking at night – a measure of the number of people reporting they feel safe at night in the sample country as collected by the OECD in the Better Life Index, recorded as a percentage rounded to the nearest decimal as of 2018.
f. Percent urbanization –a measure of the percentage of the landmass that has been developed within the sample country based on urban land area percentage as collected by the Center for International Earth Science Information Network (CIESIN)/Columbia University, recorded as a number rounded to the nearest tenth of a percent for the most recent data available.
g. Percent urban population – a measure of the percentage of the population that lives in urbanized areas a (percentage of the total population) as collected by the United Nations Population Division World Urbanization Prospects: 2018 Revision, recorded to the nearest tenth of a percent.
h. Land area – a measure of the total size of the country as collected by the World Bank, recorded to nearest integer from the most recent reported size.

- Demographic
    a. Net migration – a measure of the net migration quantity of migrants as reported by the United Nations Population Div. World Population Prospects: 2019 Rev., recorded as a number rounded to the nearest 100K as of 2018.
    b. Net migration rate – a measure of the number of immigrants minus the number of emigrants over a period, divided by the person-years lived by the population of the receiving country over that period. It is expressed as the average annual net number of migrants per 1,000 population as reported by the United Nations Population Division. World Population Prospects: 2019 Revision, recorded as a number rounded to the nearest decimal as of 2018.
    c. Population – a measure of the size of the population in the sample country as reported by the United Nations Population Div. World Population Prospects: 2019 Rev., recorded as a number rounded to the nearest 100K as of 2018.
    d. Population density – a measure of the density of the population in the sample country as people per sq./km of land area as collected by the Food and Agriculture Organization and World Bank population estimates, recorded as a number rounded to the nearest whole person per square kilometer as of 2018.
- Monetary

Measuring a country's currency system relative to other currency systems is an important component of this research and is based partially on Cohen's currency pyramid, where the U.S. dollar is positioned at the top and the next two currencies are the Japanese yen and European euro. By taking measurements for the rest of the countries relative to the three dominant fiat

currencies in the world, I constructed a measure of the subject country's currency strength. Two commodity-gold measurements were added as a baseline of monetary strength for each country.

- Strength of foreign exchange of currency to USD – a measure of the relative strength of a given nation's current unit of currency to U.S. dollars as collected by the website x-rates.com's weekly foreign exchange rates for the week ending June 2, 2018.
- Strength of foreign exchange of currency to CNY – a measure of the relative strength of a given nation's current unit of currency to Chinese yen as collected by the website x-rates.com's weekly foreign exchange rates for the week ending June 2, 2018.
- Strength of foreign exchange of currency to EUR – a measure of the relative strength of a given nation's current unit of currency to the euro as collected by the website x-rates.com's weekly foreign exchange rates for the week ending June 2, 2018.
- Cost in national currency for an ounce of gold – a measure of the relative strength of a given nation's current unit of currency to an ounce of gold as the exchange rate for the national currency to an ounce of gold as collected by the industry monitoring website xe.com for the week ending June 2, 2018.
- Gold reserves – a measure of the amount of gold on reserve by a country as reported by the World Gold Council and consisting of five separate metrics by a sample country for the most recent year:
    a. The amount of gold in tonnes [sic] on reserve
    b. The amount of gold in USD on reserve by a sample country
    c. The foreign exchange reserves less gold
    d. The foreign exchange reserves with gold
    e. The percent of foreign exchange reserves as gold

Independent variable type #3 – trust in society and government

Individual trust others and in government

The World Values Survey (WVS) is a global social science research project started in 1981 that seeks to capture the "changing values [of the citizens of each country] and their import on social and political life" in approximately 100 countries. The measurement of trust in society and in government was done by using six questions from the sixth wave (iteration) of this project, the 2014 WVS (Inglehart, et al., 2014), that focus on a respondent's views of who they trust in society, what constitutes democracy, and their perceptions of trust in their government. For countries not in the WVS sample, the European Values Study (EVS) 2017 (European Values Study, 2018) was used. The EVS is nearly identical to the WVS and initially was used in the 1970s, before the first WVS wave in 1981. The EVS covers fewer countries overall than the WVS so it was only used if the country was not sampled in the WVS. The questions used were:

1. Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?

   Answers to this question were recorded as a binary 0 or 1: 1 Most people can be trusted | 0 Need to be very careful.

2. Could you tell me for each whether you trust people from this group completely, somewhat, not very much or not at all?

   a) Your family
   b) Your neighborhood
   c) People you know personally
   d) People you meet for the first time
   e) People of another religion

f) People of another nationality

Answers to this question were recorded with a Likert-style scalar according to this coding: 1 – Trust completely; 2 – Trust somewhat; 3 – Do not trust very much; 4 – Do not trust at all.

3. How much confidence does the respondent have in these organizations?

    a) The churches
    b) The armed forces
    c) The press
    d) Television
    e) Labor unions
    f) The police
    g) The courts
    h) The government (in your nation's capital)
    i) Political parties
    j) Parliament
    k) The Civil service
    l) Universities

Answers to this question were recorded with a Likert-style scalar according to this coding: 1 – a great deal of confidence; 2 – quite a lot of confidence; 3 – not very much confidence; 4 - none at all.

4. Which is a very good, fairly good, fairly bad or very bad way of governing this country?

    a) Having a strong leader who does not have to bother with parliament and elections.

    b) Having experts, not government, make decisions according to what they think is best for the country

    c) Having the army rule

    d) Having a democratic political system

    Answers to this question were recorded with a Likert-style scalar: 1 is Very good; 2 is Fairly good; 3 is Fairly bad; 4 is Very bad.

5. For each of the following things how essential is it as a characteristic of democracy?

    a) Governments tax the rich and subsidize the poor.

    b) Religious authorities ultimately interpret the laws.

    c) People choose their leaders in free elections.

    d) People receive state aid for unemployment.

    e) The army takes over when government is incompetent.

    f) Civil rights protect people from state oppression.

    g) The state makes people's incomes equal.

    h) People obey their rulers.

    i) Women have the same rights as men.

    Answers to this question were recorded with a scalar of 1-10, where 1 means "not at all an essential characteristic of democracy" and 10 means it definitely is "an essential characteristic of democracy."

6. How important is it to live in a country that is governed democratically?

   Answers to this question were recorded with a scalar from 1-10, where 10 means it is "not at all important" and 1 means "absolutely important."

7. How democratically is this country being governed today?

   Answers to this question were recorded with a scalar from 1 to 10, where 10 means that it is "not at all democratic" and 1 means that it is "completely democratic."

Democratic governance

Economist Intelligence Unit Democracy Index (EIUDI) (Economist Intelligence Unit, 2018) tracks the status of the establishment of democracy in 165 countries around the world among five categories: electoral process and pluralism, civil liberties, the functioning of government, political participation, and political culture. Countries are scored along 60 variables and assigned a whole number value as one of four types 1-4: 1 full democracy, 2 flawed democracy, 3 hybrid regime, and 4 authoritarian regime.

For this study, I constructed a democratic governance variable utilizing the tracking done by the Economist Intelligence Unit for democratic institutions in the sample countries from the most recently available assessment, 2018. The variable was recorded as a whole number of the country's rank in measured democratic status.

Research design

Design type

The research design was a cross-sectional research study of countries that have residents who use Bitcoin and cryptocurrency. This fulfilled the goal of the research questions to capture the measurement variables at a point in time to analyze the relationships. The IV/DV

measurements were strictly quantitative in nature and the analysis was statistically driven. The aspects of measurement which were subjective and interpretive were the assessments of public policy in the sample countries to convert the policy position to a quantitative measurement, but a composite of each country's policy regimes was created that smoothed interpretative differences for each country's policy positions. However, for most of these measurement scenarios, the modified Likert-style measurement was relatively easy to assess given the limited variable choices of ~20% intervals (0-4 values).

Time dimension

The time dimension for this study was a point-in-time measurement of the dependent variable of digital currency usage on or about May 31, 2018. There was no longitudinal component nor repeat measurement of the variables. Because the goal of the study was to measure the phenomena of Bitcoin and cryptocurrency use, as more time elapses, the nexus between the independent and dependent variables diminish. Societal factors are less sensitive to time; this study used factors based on the most recent available, preferably 2018 or later. In the case of WVS and EVS, the most recent wave concluded in 2014 and 2017, respectively.

Type of experiment

This study used secondary data that allows comparisons among metrics and it was a non-experimental design because the independent variables of societal and public policy factors could not be experimentally altered. The goal of non-experimental studies is to measure a relationship not to prove causation. There was no control group for this study, nor was there a random assignment to groups.

Sample

The population for this study was all countries with residents who may have interest, perceptions, or usage of Bitcoin and cryptocurrency. This is presumed to be at or close to the 279 countries recognized by the United Nations. The sample for one of the dependent variables for this research study was a convenience sample identical to the countries selected by ING/Ipsos based on their survey methodology, which numbered 15. In the case of other dependent variables, there were 28 countries' data sampled based on G7 and G20 membership, in addition to the overlapping sample in the ING/Ipsos survey data, as discussed below.

Sampling technique

The technique used to sample the population was a modified convenience sample strategy. The base sample was G20 countries, which represent the most developed countries in the world; however, within this sample there was a considerable range of in-country metrics for the variables being measured, a goal of the research. From the G20 countries, the major dataset from ING/Ipsos was selected because it was a survey of 15 of the G20 countries. The research goal was to measure countries across a broad range of economic status, but in such a way that there was sufficient economic activity to have measurable cryptocurrency activity, thus the target demographic of the ING/Ipsos survey was ideal.

However, by sampling only the G20 countries and not a random sample of all countries in the world, the data could be skewed towards developed countries' use of Bitcoin and cryptocurrency; as noted in my hypotheses, the level of a country's economic development is a societal characteristic that may lead to greater cryptocurrency usage and vice versa. This caveat to the sampling method was considered during the analysis and interpretation of results. With all of this in mind, the ING/Ipsos data was determined to be the best-case scenario of 15 countries

that would otherwise meet the research criteria. However, these sampling methodologies essentially leave out the entire continent of Africa, an important emerging socio-economic region of the world, among other areas of the world.

The convenience of using these 15 or 28 countries for which all variables were available and reliable justifies this initial approach. This was non-probability sampling and was appropriate given the non-experimental, exploratory nature of this research. Future research could build upon this work and study the next 20 countries beyond the G20 or these 15 in the ING/Ipsos dataset, like the continent of Africa or Asia-Pacific countries.

Data collection

The data collection technique for this research was a review and analysis of the metrics from the specified secondary data collection sources. Data collection was completed during the months after the release of the ING/Ipsos data (fall, 2018) for all measurements.

Limitations

The most significant limitation of this research was the uniqueness of cryptocurrency and especially Bitcoin. Cryptocurrencies have complex technical underpinnings and underdeveloped user interfaces. They are not yet user-friendly. This makes them less receptive to quick adoption, no matter how interested a user may be in the possibility. Measuring perceptions of a complex new form of money was confounded by the difficulty the average person has with understanding the technology, much less the concept, of a new currency. However, this is similar to the situation encountered in the latter decades of the 20th century with regard to the adoption of new networking technologies. During the 1980s and 1990s, the development and use of basic telecommunications protocols and the internet were taking place and important to measure and understand, though the average person could not fully use or comprehend the

potential of such technologies at the time. Those examples and other technology adoption curves are instructive for this research.

Another potential concern was the quality of the data. The respondents to the ING/Ipsos survey may not have been representative of the general populations of the countries under study. The data on Bitcoin and cryptocurrency usage may have provided imperfect measures of actual individual-level decisions to use them as a currency. Because the ING/Ipsos survey section on cryptocurrencies terminated if the user had not heard of cryptocurrency, getting data from respondents about the topic of a "new money" was not possible if they did not already know about this particular "new money", which potentially skewed the survey data towards people favorably disposed to Bitcoin and potentially masking perceptions from individuals that will never be interested in a new currency. The fluidity of public policy and the difficulty in assessing a given policy's impact also presented challenges. However, these appear to be the best and only data available in a rapidly changing field of inquiry. It is important to note, ING/Ipsos conducted a second survey of the same 15 countries in the fall of 2019, including cryptocurrency questions again, that could be used to test this initial research.

To my knowledge, this research was the first of its kind, analyzing currency systems that are the first of their kind. Concerns about validity are inevitable when dealing with emergent phenomena and new sources of data. Furthermore, the novelty of cryptocurrency, early adopters' bias toward anonymity, and the public's hesitancy to discuss monetary (of any kind) issues make information about individual attitudes difficult to collect, particularly across multiple national contexts. However, the uniqueness and potential value of the data sources analyzed in this study must, therefore, be emphasized even if they are not as rigorous and well-studied as those used in other areas of social scientific inquiry. Moreover, the results of this

research provide models for better ways of measuring cryptocurrency perceptions and use. In particular, this research helped establish composites and indices for the measurement of the cryptocurrency phenomena that will make future analyses easier for others.

Results and Analysis

The data were collected as described above and initial analysis tests were done to determine a statistical methodology that had the greatest utility for analysis. Given the uniqueness of the subject matter and the limited availability of research data on cryptocurrency, there were significant limitations to the ability to integrate the ING/Ipsos and WVS/EVS data into a single dataset. As such, the ING/Ipsos data and the WVS/EVS datasets were treated as discrete sets and a methodology was determined to aggregate the measurements from each dataset in combination with per-country metrics (and triangulate between the datasets) to arrive at meaningful insights and rigorous analysis. Thus, what was achieved was a meaningful analysis of the ING/Ipsos per-country data, the WVS/EVS per-country data, and then an analysis of between-country data to model usage and perceptions and the relationship between them both.

In principle, this is no different than what researchers using cross-sectional WVS/EVS data have always done, but with the added challenge of the small sample size of countries from the ING/Ipsos data, which only covers 15 countries. The limitations of this sample size were ever-present during the analysis of these data and the summarization of the findings (see Appendix D). To ground this work in the established methodologies employed by other studies with small samples of countries, I reviewed dozens of other studies collected through Google Scholar searches that used the WVS dataset. I identified 50 articles since the year 2016 that included WVS data from Wave 6 (concluded in 2014).

The most prolific authors within this group were Christian Welzel (a member of the WVS executive committee, a PI for Waves 5 and 6, and a frequent co-author with WVS founder Inglehart) and Arno Tausch (a political scientist based in Austria). These two authors' typical approach has been to collect cross-sectional/single-wave country averages of percentage responses to binary or Likert-style questions. Their analysis is based on full and partial correlations and multivariate factor analysis – most often oblique Promax rotations – to form composites and indices on which to perform ordinary least squares (OLS) regression analysis of these reduced factors.[26] Methodologically, one of the studies most closely related to my research was found in Tausch WVS research on Inter-Partner Violence (IPV) around the world (Tausch, 2019) and that research, in particular, was modeled as a guide for this analysis.

A second major thread among the literature for cross-sectional, cross-national comparisons of country means and between-country differences followed the work of Richard Florida and Gary Gates (2001) positing technology and tolerance indices for 50 metropolitan areas in the U.S. – giving rise the term "the creative class" – in the early 2000s. Florida and Gate's work was expanded on by Das, et al. (2008), who created a "global tolerance index" based on 62 countries and WVS data and then expanded again by Zanakis, et al. (2016), who developed a "global social tolerance index" – this time, across 56 countries, again using WVS data. These latter two studies verified through extensive statistical methods the internal reliability of WVS instruments and data and, in particular, the trust questions used in the present research.

[26] For many of these types of studies, a multi-level model (MLM, or hierarchical linear regression) was performed, but that approach relies on the data being in a single dataset, a feature not available in the present research. In the future research discussion below, a method is suggested that would make MLM feasible.

In summary, to analyze the available data on Bitcoin and cryptocurrency, a hybrid methodology based on recent cross-country research was adopted to utilize country-level means of the independent and dependent variables for between-country analysis to model Bitcoin and cryptocurrency perceptions and usage. Additionally, a multivariate PCA factor analysis of all independent and dependent variables was undertaken to explain reported perceptions and usage base on the rankings and patterns in the between-country analysis and an OLS regression performed on those factors, composites, and indices.

Descriptives, composites, indices, and factors

Dependent variable #1 – perceptions of Bitcoin and cryptocurrency

The first dependent variable measurements were from questions asked on the ING/Ipsos survey of 15 countries regarding cryptocurrency awareness, perceptions, ownership, and use. Descriptive summaries for this survey instrument were as follows:

ING/Ipsos Country Response Distribution			
	N	Percent	Cumulative Percent
Austria	1009	6.8	6.8
Belgium	1008	6.8	13.6
France	1060	7.1	20.8
Germany	1005	6.8	27.5
Italy	1018	6.9	34.4
Luxembourg	553	3.7	38.1
Netherlands	1029	6.9	45.1
Poland	1023	6.9	52.0
Romania	1007	6.8	58.8
Spain	1019	6.9	65.6
Turkey	1021	6.9	72.5
United Kingdom	1016	6.9	79.4
Czech Rep.	1031	7.0	86.3
USA	1008	6.8	93.1
Australia	1021	6.9	100.0
Total	14828	100.0	

Table 1. ING/Ipsos Country Response Distribution

ING/Ipsos Responses by Gender					
		Frequency	Percent	Valid Pct	Cumulat. Pct
Valid	Man	7253	48.9	48.9	48.9
	Woman	7575	51.1	51.1	100.0
	Total	14828	100.0	100.0	

Table 2. ING/Ipsos Gender Frequency Distribution

Tables 1 and 2 show the full sample of approximately 15,000 respondents. The numbers of respondents per country and by gender were evenly distributed.[27] (Other demographic characteristics like education, income, and household size were reviewed and also well-distributed but not formally considered in this research.)

The two main sections of the instrument that were used for analysis relevant to cryptocurrency from the survey responses were 1) related to the respondents' awareness, ownership, and expected ownership of cryptocurrency, and 2) their potential usage of cryptocurrency.

Awareness, ownership, and expectation to own Bitcoin and cryptocurrency

The perceptions and ownership questions asked the respondent whether they had heard of cryptocurrency and whether they owned it or expected to own it in the future. The tables below summarize the descriptive results (frequencies are included in Appendix E). The "Yes" responses per country were as follows:

[27] Luxembourg's n=553 was intentional based on weighting of the N population of the country relative to the rest of the sampling from the other 14 countries. For the fuller description of this methodology see https://think.ing.com/articles/where-is-cryptocurrency-headed-in-the-eyes-of-consumers-online-spending/

I have:		Heard of Crypto	Own Crypto	Expect to Own
Country		Percent	Percent	Percent
Austria	Yes	79.3	8.3	19.0
Belgium	Yes	38.0	4.5	10.0
France	Yes	49.9	5.8	16.8
Germany	Yes	70.3	7.7	20.8
Italy	Yes	70.1	7.8	23.6
Luxembourg	Yes	67.3	4.0	11.9
Netherlands	Yes	54.5	7.3	13.5
Poland	Yes	77.2	11.4	29.4
Romania	Yes	74.7	12.5	38.3
Spain	Yes	66.8	10.0	32.0
Turkey	Yes	70.7	18.1	45.4
United King.	Yes	60.6	6.0	14.3
Czech Republic	Yes	69.3	8.9	18.6
USA	Yes	56.5	7.7	20.3
Australia	Yes	70.0	6.3	14.5

Table 3. Per-country Percentages of Respondents who have Heard of, Own, or Expect to Own a Cryptocurrency

Ranked by each question, the charts for the "Yes" responses were as follows:

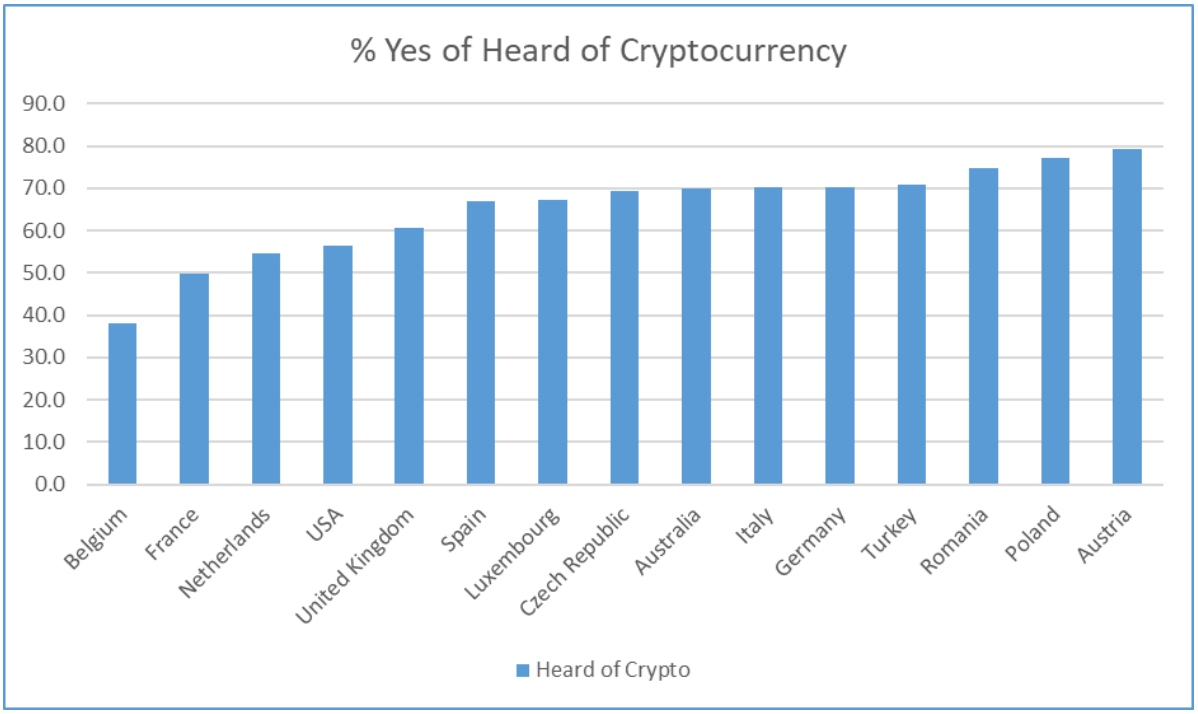

Chart 1. Per-country Percentages of Respondents Who Have Heard of Cryptocurrencies

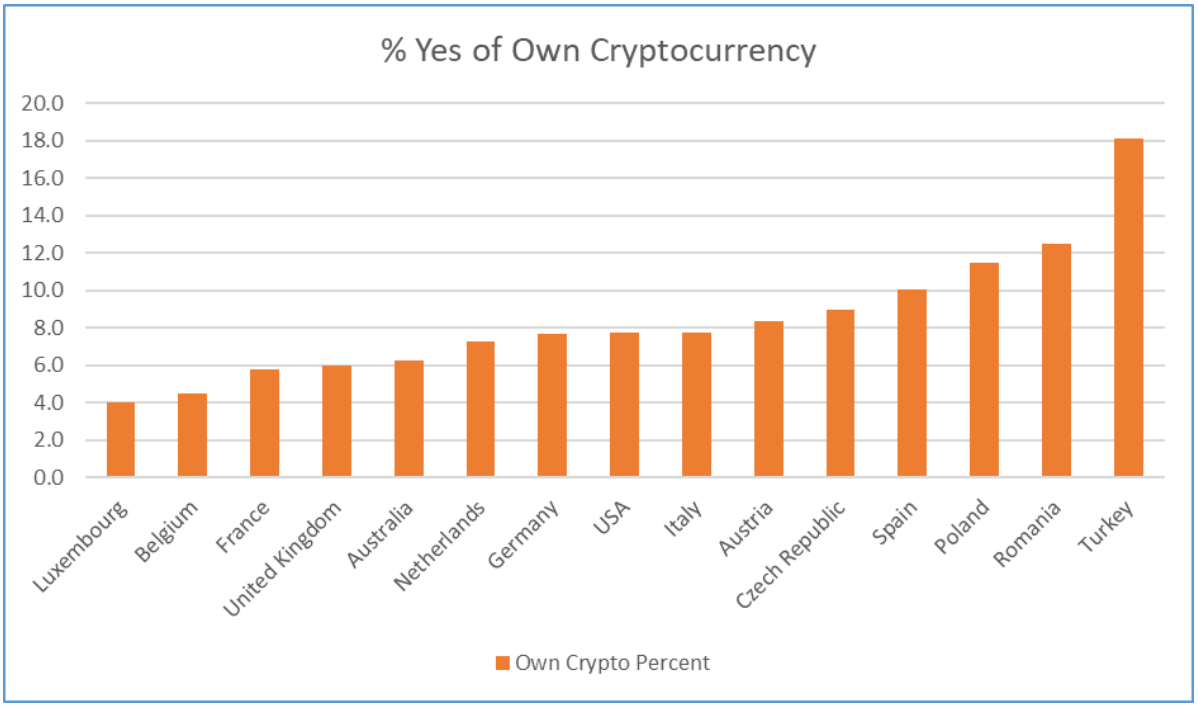

Chart 2. Per-country Percentages of Respondents Who Own Cryptocurrency

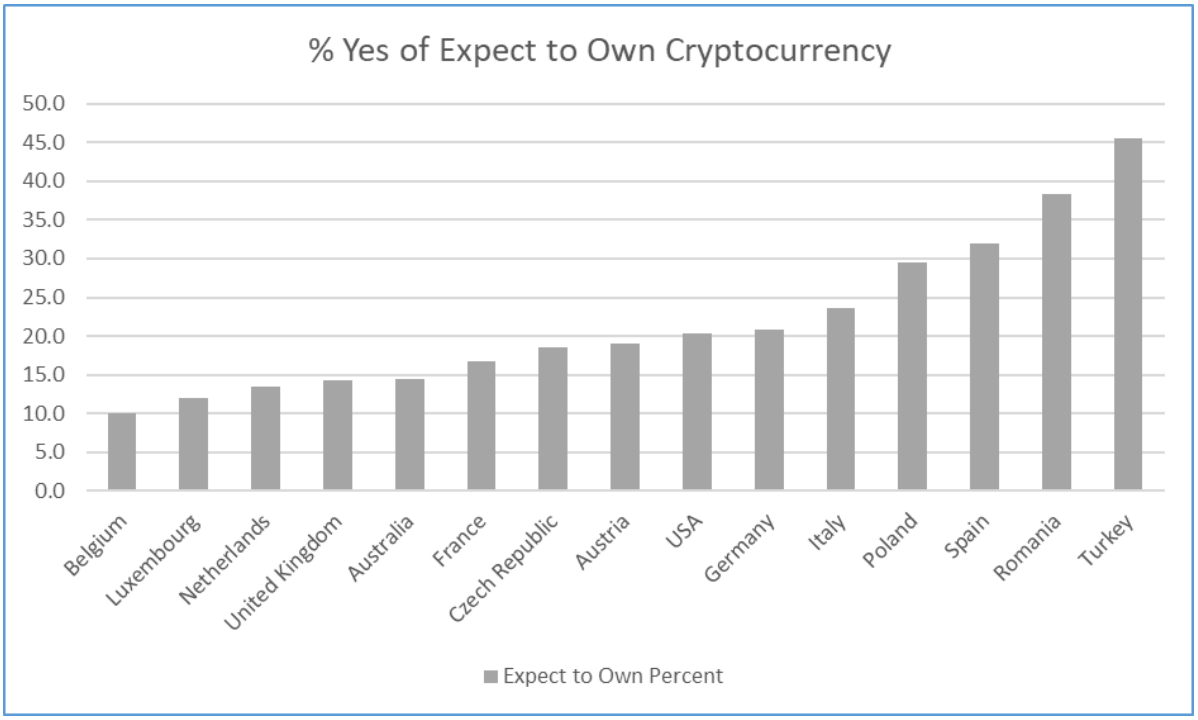

Chart 3. Per-country Percentages of Respondents Who Expect to Own Cryptocurrency

Because each country's overall percentage of each of the preceding questions is considered more favorable towards cryptocurrency, an overall cumulative "Yes" to each question was tabulated and is graphed in Chart 4:

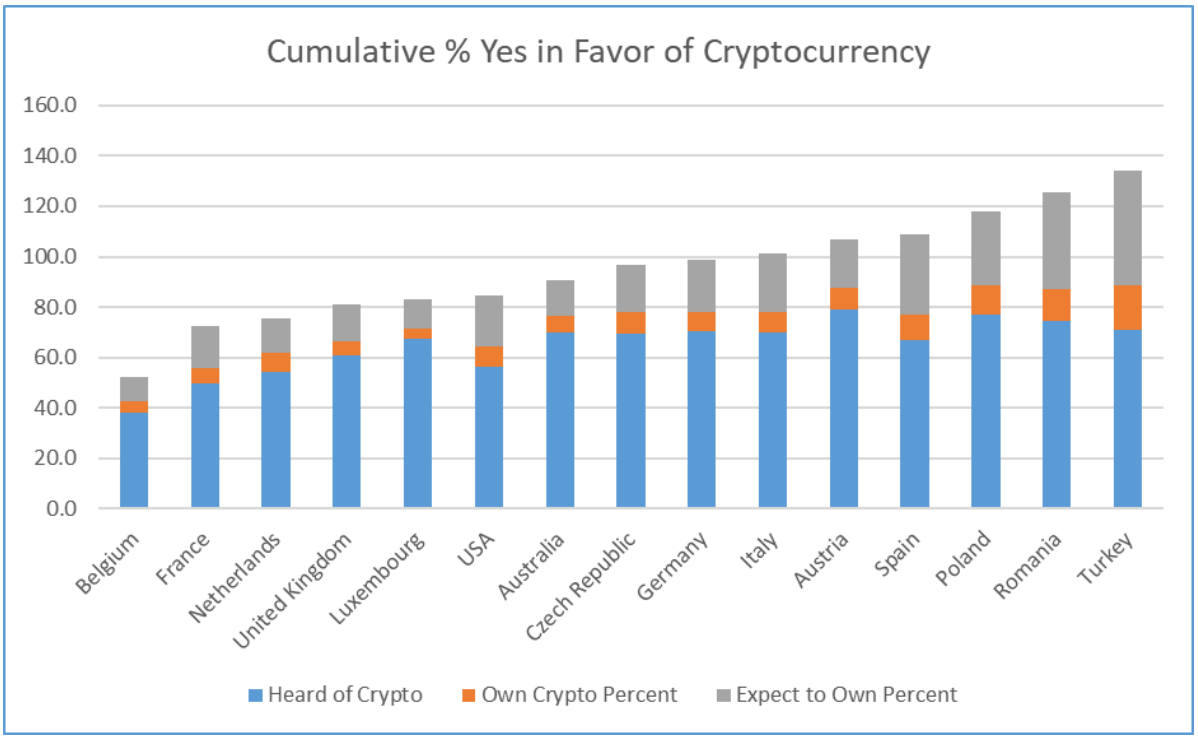

Chart 4. Per-country Cumulative Percentages of Respondents Who Have Heard of, Own, or Expect to Own Cryptocurrency

The favorability of cryptocurrency across the proceeding three charts combined with the cumulative results in the fourth chart suggest a trend of extremes, with Belgium, Luxembourg, and the Netherlands being less favorable to cryptocurrency, and Poland, Romain and Turkey being more favorable. The descriptive statistics in Table 4 summarize the means, dispersion, and ranges of these variables:

Descriptives of % Yes, I have heard, own, expect to own					
	N	Minimum	Maximum	Mean	SD
Own Crypto	15.0	4.0	18.1	8.4	3.6
Expect to Own	15.0	10.0	45.4	21.9	10.2
Heard of Crypto	15.0	38.0	79.3	65.0	11.2
Cumulat. % Yes	15.0	52.5	134.2	95.3	21.6

Table 4. Descriptives of Per-country Respondents Who Having Heard of, Own, or Expect to Own Cryptocurrency

Use of Bitcoin and cryptocurrency for common currency purposes

The second relevant question from the ING/Ipsos data asked the respondent to consider whether they would use cryptocurrencies such as Bitcoin for common currency purposes, e.g., buying a cup of coffee, receiving take-home pay, paying taxes. Respondents were able to say "Yes" to a particular usage of cryptocurrency but could say "No" for more than one reason (i.e., don't want to change, too risky, want to hold cryptocurrency for investment). Because these questions involved a binary yes/no with 1-3 possible answers across seven dimensions, factor analysis was used to determine if a loading or pattern of answers emerged. A principal component analysis (PCA) was performed with a Promax rotation. Approximately 72% of the variance was explained by three components. The results of the Kaiser-Meyer-Olkin and Bartlett's Test are provided in Tables 5 and 6:

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.631
Bartlett's Test of Sphericity	Approx. Chi-Square	362915.503
	df	378
	Sig.	0.000

Table 5. KMO and Bartlett's for PCA of Cryptocurrency for Common Currency Purposes

Total Variance Explained							
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotated. Sums of Squ. Loadings[a]
Component	Total	% of Var.	Cumlat. %	Total	% of Var.	Cumlat. %	Total
1	8.043	28.723	28.723	8.043	28.723	28.723	7.553
2	6.180	22.070	50.793	6.180	22.070	50.793	6.900
3	5.823	20.797	71.591	5.823	20.797	71.591	6.691
4	0.927	3.310	74.901				
5	0.673	2.405	77.305				
6	0.663	2.369	79.674				
7	0.563	2.011	81.685				
8	0.500	1.784	83.469				
9	0.439	1.568	85.037				
10	0.433	1.548	86.585				
11	0.412	1.470	88.055				
12	0.395	1.412	89.467				
13	0.373	1.331	90.798				
14	0.352	1.259	92.057				
15	0.343	1.224	93.281				
16	0.331	1.184	94.465				
17	0.298	1.066	95.530				
18	0.283	1.011	96.541				
19	0.251	0.895	97.436				
20	0.218	0.778	98.214				
21	0.196	0.702	98.916				
22	0.185	0.660	99.576				
23	0.028	0.099	99.675				
24	0.022	0.078	99.753				
25	0.019	0.069	99.822				
26	0.019	0.067	99.889				
27	0.016	0.057	99.946				
28	0.015	0.054	100.000				
Extraction Method: Principal Component Analysis.							
a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.							

Table 6. Total Variance for PCA of Cryptocurrency for Common Currency Purposes

The PCA pattern matrix was set for an absolute value of 0.3 or greater and resulted in a clear pattern of the usage-type questions focused on a respondent's interest in using Bitcoin for all transaction types. There were also factor loadings on two other main expressions: Bitcoin

was deemed too risky, or Bitcoin was only seen as an investment (speculative). A fourth loading was negatively correlated in all PCA components (though to a far less extent, while being above the threshold of greater than or equal to an absolute value (abs ≥) 0.3 loading): the tendency for respondents to be uninterested in changing their currency for the given type of transaction. The factor loadings per component are reported in Table 7:

Factor Analysis Pattern Matrix – Promax rotation			
	Component		
	1	2	3
Buy Coffee w BTC, yes		0.832	
Take-home pay w BTC, yes		0.785	
Pay taxes w BTC, yes		0.903	
Pay elec bill w BTC, yes		0.931	
Buy plane fare w BTC, yes		0.913	
Internat. payment to buy product online w BTC, yes		0.866	
Save for child's tuition w BTC, yes		0.817	
Buy Coffee w BTC, no, don't want to change	-0.397	-0.437	-0.322
Take-home pay w BTC, no, don't want to change	-0.395	-0.352	-0.395
Pay taxes w BTC, no, don't want to change	-0.388	-0.452	-0.361
Pay elec bill w BTC, no, don't want to change	-0.387	-0.472	-0.344
Buy plane fare w BTC, no, don't want to change	-0.365	-0.499	-0.334
Internat. pymt to buy product online w BTC, no, don't want to change	-0.342	-0.490	-0.322
Save for child's tuition w BTC, no, don't want to change	-0.365	-0.420	-0.367
Buy Coffee w BTC, no, too risky			0.874
Take-home pay w BTC, no, too risky			0.853
Pay taxes w BTC, no, too risky			0.919
Pay elec bill w BTC, no, too risky			0.933
Buy plane fare w BTC, no, too risky			0.921
Internat. payment to buy product online w BTC, no, too risky			0.893
Save for child's tuition w BTC, no, too risky			0.839
Buy coffee w BTC, no, BTC only an investment	0.951		
Take-home pay w BTC, no, BTC only an investment	0.928		
Pay taxes w BTC, no, BTC only an investment	0.970		
Pay elec bill w BTC, no, BTC only an investment	0.984		
Buy plane fare w BTC, no, BTC only an investment	0.973		
Internat. pymt to buy product online w BTC, no, BTC only an invest.	0.943		
Save for child's tuition w BTC, no, BTC only an investment	0.918		
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.			
a. Rotation converged in 6 iterations.			

Table 7. Factor Loadings per Component of PCA of Cryptocurrency for Common Currency Purposes

Because of the clear clustering of each type of cryptocurrency use or avoidance, and to make the responses to this question easier to analyze, a composite of the responses to each type was created for each case. Given the nature of each response ("Yes, I would buy *X* with cryptocurrency"; "No, I don't want to change the way I pay"; "No, cryptocurrency is too risky"; "No, cryptocurrency is only an investment for me"), these composites were labeled as corresponding to four typical personality types: Evangelist, Pragmatist, Skeptic, or Speculator. An evangelist is someone who believes in a broad structure and methodology and its applicability to a wide variety of circumstances, but the general population does not necessarily share that belief system. Because a subset of the respondents chose Bitcoin for all currency uses, this seems like an applicable title for those individuals, especially since there is no broad agreement on the methodology and applicability of Bitcoin to any or all currency type uses. A pragmatist is someone who tends to be less moved by novel reasoning to change opinion or behavior for no readily apparent benefit, so this is an apt title for individuals that indicated they did not want to change currencies for any currency use type; by contrast, skeptics are actively opposed to topics or ideas because of perceived deficiencies or lack of benefit so those individuals that chose Bitcoin as too risky for all currency type uses were given this name. Finally, individuals that were opposed to any currency use type for Bitcoin because they only see Bitcoin as an "investment" (this is generally considered a high risk/reward investment) were given the title of a speculator.

The maximum value for each composite type of use was then 7 for "Yes" answers and potentially 21 for "No" answers. Logically, the "No" responses would likely be clustered around "No, I don't want to change the way I pay" and "No, too risky" versus "No, cryptocurrency is only an investment," which means a total between 7 and 14 was more likely. Of note, if the

respondent had indicated they *had not* heard of cryptocurrency, the respondent did not receive this series of questions; these cases were recorded as missing values in the dataset (frequencies included in Appendix D). A mean of each country's personality types was calculated, as presented in Table 8:

Usage Type Index Mean by Country					
Country - Mean		**Evangelist**	**Pragmatist**	**Skeptic**	**Prospector**
Austria	**Mean**	0.9	3.8	1.5	1.1
Belgium	**Mean**	0.8	3.7	1.6	1.1
France	**Mean**	1.1	3.4	1.4	1.3
Germany	**Mean**	1.0	3.6	1.5	1.1
Italy	**Mean**	2.0	2.9	1.2	1.0
Luxembourg	**Mean**	0.7	4.1	1.4	1.1
Netherlands	**Mean**	0.7	3.9	1.7	0.9
Poland	**Mean**	1.5	3.0	1.6	1.1
Romania	**Mean**	2.2	2.6	1.1	1.2
Spain	**Mean**	1.8	2.9	1.4	1.1
Turkey	**Mean**	2.6	2.7	0.7	1.1
United Kingdom	**Mean**	0.9	3.6	1.8	1.0
Czech Republic	**Mean**	1.2	3.4	1.1	1.4
USA	**Mean**	1.4	3.1	1.8	1.1
Australia	**Mean**	0.8	3.7	2.0	0.9

Table 8. Usage Type Index Mean by Country

Descriptive statistics relating to these personality types of cryptocurrency users are provided in Table 9:

Descriptives of Perspective on Cryptocurrency Use by Country					
	N	**Minimum**	**Maximum**	**Mean**	**SD**
prospector	15	0.88	1.45	1.10	0.14
evangelist	15	0.65	2.65	1.31	0.60
skeptic	15	0.67	1.97	1.45	0.33
pragmatist	15	2.60	4.05	3.35	0.47

Table 9. Descriptive Statistics of Perspectives on Cryptocurrency Use

Measures of the Evangelist and Prospector personality perspective were higher when the respondent provided answers that were more favorable to cryptocurrency. While these types could be closely related in many cases, for the purposed of this research, an evangelist supports the use of Bitcoin for all usage types while a speculator is only supportive of one type and not any other types (investment, pursuant to the question asked of them). Interestingly, the Speculator type is essentially dependent on the Evangelist type to promote Bitcoin so it increases in use and then increases in value.[28] The measure of the Skeptic perspective was higher when the respondent provided answers less favorable to cryptocurrency. The Pragmatist personality type was a neutral category, offering answers that were in between the other categories.

The following four charts provide a more detailed view of the relative position of each country's personality perspectives. As can be seen again, northern European countries tended to have more cryptocurrency skeptics, and southeastern European Romania and Turkey were situated at the extreme of having more individuals in the evangelist and prospector categories:

[28] However, this is a paradox that the cryptocurrency world is beginning to see and appreciate. If users have to use the currency for it to become more popular to increase in value but people are hesitant to use it as it may rapidly and significantly increase in value, then there is a bit of a chicken-and-egg problem. This harkens Cohen's currency pyramid among permeate or plebian and higher-level currencies or the Chinese yuan/renminbi dichotomy.

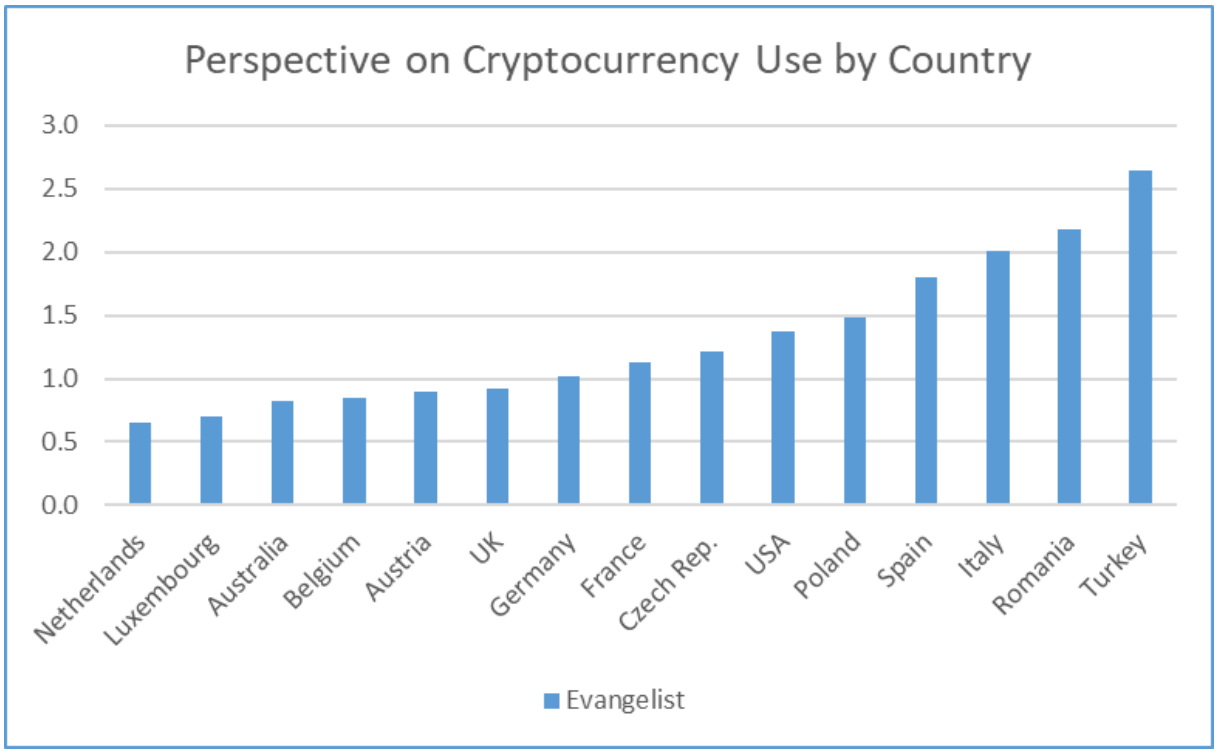

Chart 5. Average Evangelist Perspective per Country

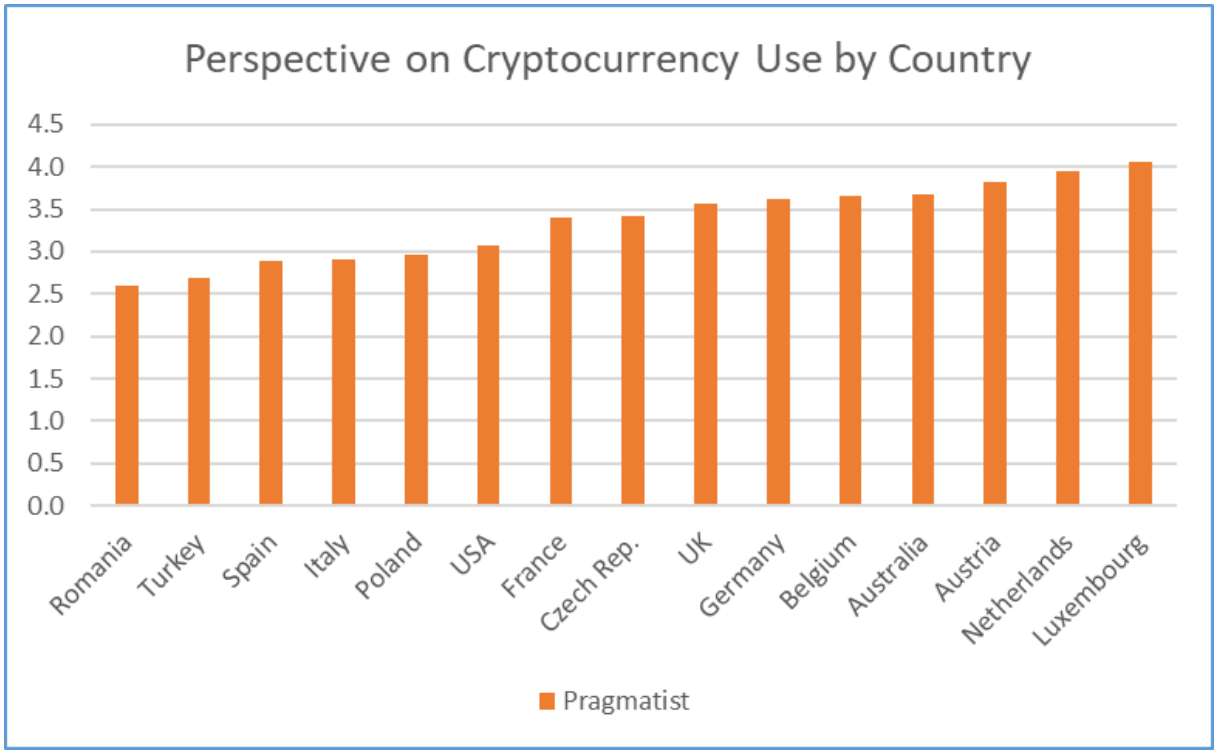

Chart 6. Average Pragmatist Perspective per Country

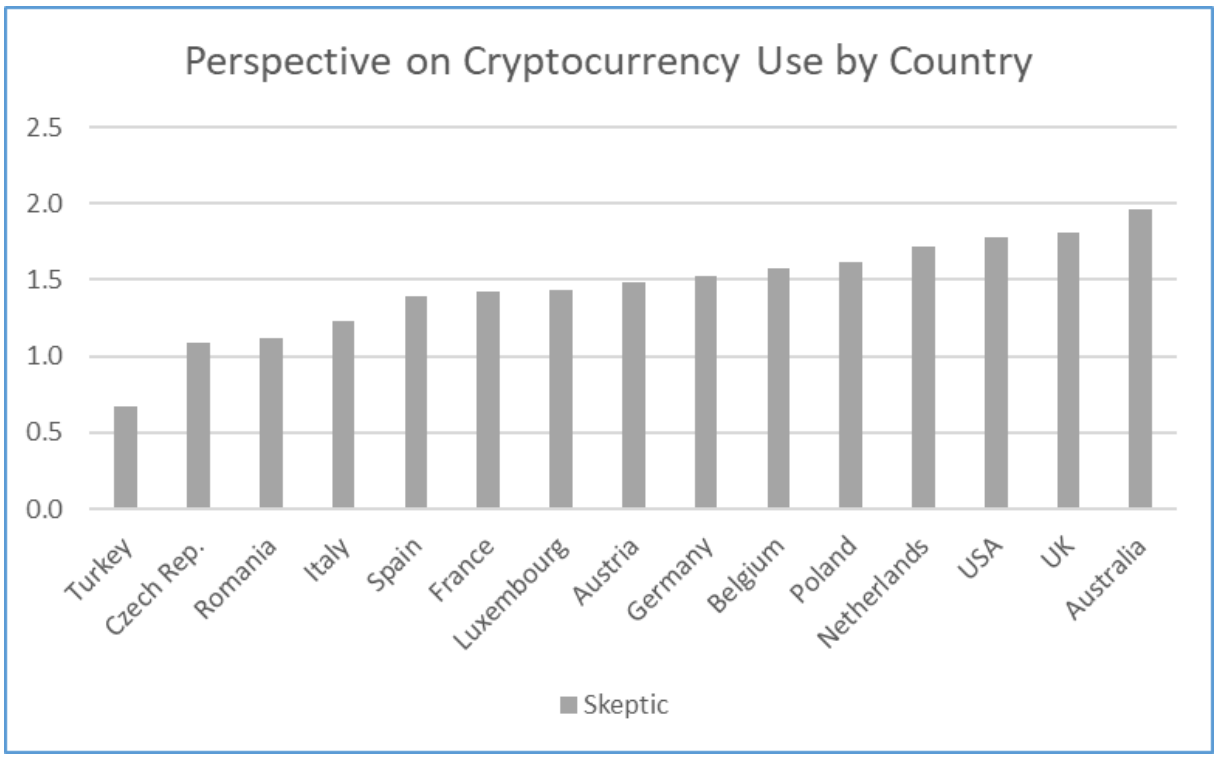

Chart 7. Average Skeptic Perspective per Country

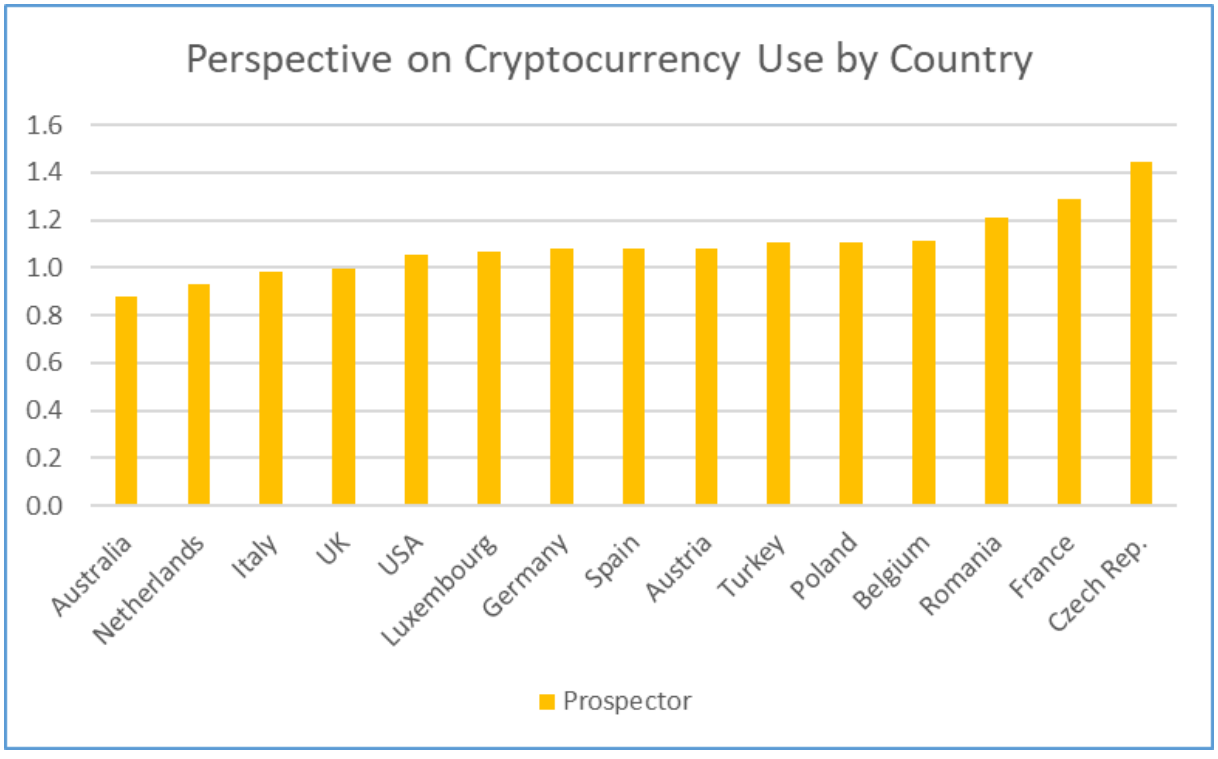

Chart 8. Average Prospector Perspective per Country

Dependent variable #2 – usage of Bitcoin

The second set of dependent variables focused on direct action by individuals to seek information about Bitcoin or attempt to use Bitcoin. They included:

1. Google Trends internet search interest rank of the term "bitcoin" for the trailing 5 years from May 31, 2018.
2. Number of Bitcoin Automated Teller Machines (ATMs) in-country on May 31, 2018.
3. Number of Bitcoin Mining Nodes in-country on May 31, 2018.

These data (shown in Table 10) were collected for the full list of 28 countries based on the overall research methodology described above. Because the ATM and nodes metrics were heavily dependent on user behavior, the population in millions in each country is included for a per capita measurement in addition to the raw measurement. The summary descriptive statistics are provided in two lists: a list of all (n=28) countries in the sample and a list of the 15 ING/Ipsos sample countries, corresponding to Tables 11 and 12, respectively.

Google Trends, ATMs, Bitcoin Nodes in All Sample Countries						
Country	**Google Trnd**	**ATMs**	**Nodes**	**Population(M)**	**ATMs/Cap(M)**	**Nodes/Cap(M)**
Indonesia	14	1	3	267.671	0.0037	0.0112
India	5	1	26	1352.642	0.0007	0.0192
Mexico	17	11	8	126.191	0.0872	0.0634
Saudi Arabia	10	2	3	33.703	0.0593	0.0890
Venezuela	24	1	3	28.887	0.0346	0.1039
Turkey*	11	25	13	82.34	0.3036	0.1579
Brazil	29	0	38	209.469	0.0000	0.1814
China	15	0	353	1427.648	0.0000	0.2473
South Africa	9	6	20	57.793	0.1038	0.3461
Argentina	23	11	21	44.361	0.2480	0.4734
Italy*	13	54	70	60.627	0.8907	1.1546
Spain*	19	94	59	46.693	2.0131	1.2636
Poland*	10	48	50	37.922	1.2658	1.3185
Japan	8	3	190	127.202	0.0236	1.4937
Russia	12	59	248	145.734	0.4048	1.7017
Romania*	9	38	41	19.506	1.9481	2.1019
South Korea	8	1	144	51.172	0.0195	2.8140
Belgium*	8	14	40	11.482	1.2193	3.4837
United K.*	8	273	301	67.142	4.0660	4.4830
Australia*	7	25	132	24.898	1.0041	5.3016
Austria*	12	251	52	8.891	28.2308	5.8486
USA*	6	3702	2363	327.096	11.3178	7.2242
Czech Rep.*	8	69	82	10.666	6.4692	7.6880
Canada	7	701	328	37.075	18.9076	8.8469
France*	11	2	606	64.991	0.0308	9.3244
Luxembourg*	9	0	10	0.604	0.0000	16.5563
Germany*	14	36	1891	83.124	0.4331	22.7491
Netherlands*	8	42	496	17.06	2.4619	29.0739

Table 10. Usage of Bitcoin per Country

Descriptive Statistics for Bitcoin Usage - All Sample Countries					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Dev.**
Google Trends	28	5	29	11.93	5.818
ATMs	28	0	3702	195.36	701.683
Nodes	28	3	2363	271.11	551.107
Population (M)	28	0.604	1427.648	170.44964	353.437921
ATMs/Pop(M)	28	0.0000	28.2308	2.912400	6.4486049
Nodes/Pop(M)	28	0.0112	29.0739	4.790017	7.1702974

Table 11. Descriptive Statistics for Bitcoin Usage - All Sample Countries

Descriptive Statistics for Bitcoin Usage – ING/Ipsos Sample Countries					
	N	Minimum	Maximum	Mean	Std. Dev.
Google Trends	15	6	19	10.20	3.321
ATMs	15	0	3702	311.53	941.553
Nodes	15	10	2363	413.73	723.936
Population (M)	15	0.604	327.096	57.53613	79.582593
ATMs/Pop(M)	15	0.0000	28.2308	4.110282	7.3149357
Nodes/Pop(M)	15	0.1579	29.0739	7.848619	8.5138858

Table 12. Descriptive Statistics for Bitcoin Usage - ING/Ipsos Sample Countries

Independent variable #1 – public policy

The independent variable of public policy represented a collection of quantitative measurements of the public policy positions of major governmental institutions with regard to cryptocurrencies. There were nine dimensions of public policy that ranged from recorded values of 0-1, 0-3, or 4 in several cases, and raw number count in others. While collecting the data and during preliminary analysis, two considerations arose: the nuance of interpreting policy, which, in some cases, was quite clear and in others was vague, and the reality that the dimensions of currency use and regulation were actually best measured in aggregate with regard to any currency, and especially a new one. To mitigate these interpretative challenges and to assist with the analysis of this variable, a composite was constructed of the sum of each dimension for a total count per country. Possible values of this Public Policy Index were from 0-n. The dimension metrics are listed below:

- Bitcoin and cryptocurrency legality – a measure of the relative legality of Bitcoin and cryptocurrency in the sample country: 0-3
- Bitcoin and cryptocurrency classification policy – a measure of which property of currency the sample country considers Bitcoin and cryptocurrency to be: 0-4

- Cryptocurrency exchange – a measure of the regulatory environment for cryptocurrency exchanges: 0-3
- Initial coin offering – a measure of whether ICOs are permitted to be offered in the country: 0-3
- Cryptocurrency political support – a measure of the number of political entities openly supporting/accepting Bitcoin and other cryptocurrencies: 0-n
- Cryptocurrency payments – a measure of measures whether cryptocurrency payments are permitted in-country: 0 or 1
- Fiat conversion – a measure of whether Bitcoin and cryptocurrency can be bought with the national currency: 0 or 1
- Planned legislation or regulation – a measure of whether cryptocurrency public policy has been identified as a research topic for any formal body of the government: 0 or 1
- Cryptocurrency warning – a measure of whether public policy arbiters have issued warnings about Bitcoin and cryptocurrency use: 0 or 1

The statistics for the composite Public Policy Index and its constituent measures are listed in Table 11 for all (n=28) countries, with the 15 ING/Ipsos sample countries designated with an asterisk (a list of only ING/Ipsos sample countries is included in Appendix D). Descriptive analyses are included for all sample countries and ING/Ipsos sample countries in Tables 12 and 13, respectively. Of note, the United States is ranked as having the highest policy favorability with regard to cryptocurrency, but only because of the outlier number of political organizations that reported a cryptocurrency position. This is discussed further below.

State/Public Policy Dimensions and Composite of All Sample Countries										
Country	**Comp.**	**Legality**	**Class.**	**Exch.**	**ICO**	**Politic.**	**Pymnts**	**Fiat Cv.**	**Legis.**	**Warn.**
India	2	0	0	0	0	0	0	0	1	1
China	3	0	2	0	0	0	0	0	0	1
Indonesia	3	0	2	0	0	0	0	0	0	1
Argentina	7	1	1	2	2	0	0	0	0	1
Romania*	8	1	3	1	1	0	0	1	0	1
Saudi Ar.	8	2	0	2	2	0	0	0	1	1
Belgium*	9	2	0	2	2	0	1	1	0	1
Brazil	9	2	0	2	2	0	1	1	0	1
Italy*	10	2	0	2	2	1	1	1	1	0
Czech Rep.*	10	2	2	2	2	0	1	1	0	0
S. Africa	10	2	0	2	2	0	1	1	1	1
Australia*	11	2	1	2	2	0	1	1	1	1
United K.*	11	2	2	2	2	0	1	1	1	0
France*	11	2	0	2	2	1	1	1	1	1
Poland*	12	1	3	2	2	1	0	1	1	1
Spain*	14	2	3	2	2	1	1	1	1	1
Austria*	14	2	2	2	3	1	1	1	1	1
Turkey*	14	3	2	3	3	0	0	1	1	1
Canada	15	3	1	3	3	1	1	1	1	1
Japan	15	3	3	3	3	0	1	1	1	0
Mexico	15	3	3	3	3	0	1	1	1	0
Venezuela	15	3	3	3	3	0	0	1	1	1
Netherld.*	16	3	2	3	3	1	1	1	1	1
Luxemb.*	16	2	4	3	3	0	1	1	1	1
Germany*	16	3	2	2	3	2	1	1	1	1
S. Korea	16	3	4	3	3	0	1	1	1	0
Russia	20	3	3	3	3	4	1	1	1	1
USA*	21.5	2	2.5	2	2	9	1	1	1	1

Table 13. State/Public Policy Dimensions and Composite of All Sample Countries

Descriptive Statistics for ING/Ipsos and All Countries' Policy Composite					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Dev.**
Ipsos Sam.	15	8	21.5	12.73	3.127
All Sample	28	2	21.5	11.75	4.616

Table 14. Descriptive Statistics for ING/Ipsos and All Countries' Policy Composite

Independent variable #2 – socio-economics and culture

Societal factors as described above were collected in two groups: basic demographics per country and foreign exchange-monetary/gold per country.

Basic demographic factors

The basic demographic factors measured were GDP, Gini coefficient of inequality, HDI, Happiness Index, net migration, net migration rate, population, and population density. The statistics are listed below for all (n=28) countries, with the 15 ING/Ipsos sample countries designated with an asterisk (a list of only ING/Ipsos sample countries is included in Appendix D). Descriptive analyses are provided for all sample countries and ING/Ipsos sample countries in subsequent tables.

Basic Demographic Factors in All Sample Countries								
Country	**GDP(B)**	**Gini**	**HDI**	**Happy**	**N. Mig(K)**	**N.Mig/K Pop**	**Pop. (M)**	**Pop./sq KM**
Luxemb.*	69.49	33.8	0.904	7.0903	49	16.3	0.604	250
Romania*	239.55	35.9	0.811	6.0697	-370	-3.8	19.506	85
Czech Rep.*	245.23	25.9	0.888	6.8521	110	2.1	10.666	138
South Africa	368.29	63	0.699	4.7222	727	2.5	57.793	48
Austria*	455.74	30.5	0.908	7.246	325	7.4	8.891	107
Venezuela	482.36	46.9	0.761	4.7066	-3266	-22.3	28.887	33
Argentina	518.48	41.2	0.825	6.0863	24	0.1	44.361	16
Belgium*	531.77	27.7	0.916	6.923	240	4.2	11.482	377
Poland*	585.78	31.8	0.865	6.1817	-147	-0.8	37.922	124
Turkey*	766.51	41.9	0.791	5.3726	1420	3.5	82.340	107
Saudi Arabia	782.48	-	0.853	6.3747	675	4.1	33.703	16
Netherlnd.*	913.66	28.2	0.931	7.4876	80	0.9	17.060	511
Indonesia	1042.17	38.1	0.694	5.1924	-495	-0.4	267.671	148
Mexico	1223.81	48.3	0.774	6.5945	-300	-0.5	126.191	65
Spain*	1426.19	36.2	0.891	6.3541	200	0.9	46.693	94
Australia*	1432.20	35.8	0.939	7.228	791	6.4	24.898	3
South Korea	1619.42	31.6	0.903	5.8947	59	0.2	51.172	530
Russia	1657.55	37.7	0.816	5.6479	912	1.3	145.734	9
Canada	1712.51	34	0.926	7.2781	1210	6.6	37.075	4
Brazil	1868.63	53.3	0.759	6.2998	106	0.1	209.469	25
Italy*	2073.90	35.4	0.88	6.2234	745	2.5	60.627	205
India	2726.32	35.7	0.64	4.0152	-2663	-0.4	1352.642	455
France*	2777.54	32.7	0.901	6.5921	183	0.6	64.991	122
United K.*	2825.21	33.2	0.922	7.0537	1303	3.9	67.142	275
Germany*	3996.76	31.7	0.936	6.985	2719	6.6	83.124	237
Japan	4970.92	32.1	0.909	5.8861	358	0.6	127.202	347
China	13608.15	38.6	0.752	5.1909	-1742	-0.2	1427.648	148
USA*	20494.10	41.5	0.924	6.8923	4774	2.9	327.096	36

Table 15. Basic Demographic Factors in All Sample Countries

Descriptive Statistics of Basic Demographic Factors in All Sample Countries					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
GDP(B)	28	69487.92	20494100.00	2550525.036	4359963.558
Gini	27	25.9	63.0	37.14	8.16
HDI	28	0.640	0.939	0.8471	0.0842
Happy	28	4.015	7.488	6.2300	0.8886
Net Mig.(K)	28	-3266000	4774000	286678.6	1462434.2
Net Mig. Rate (per 1/K Pop.)	28	-22.3	16.3	1.62	6.02
Population (M)	28	604000	1427648000	170449642.9	353437921.1
Population Dens.(Pop./sq KM)	28	3	530	161.3	156.6

Table 16. Descriptive Statistics of Basic Demographic Factors in All Sample Countries

Descriptive Statistics of Basic Demographic Factors in ING/Ipsos Sample Countries					
	N	Minimum	Maximum	Mean	Std. Deviation
GDP(B)	15	69487.92	20494100.00	2588907.271	5084336.225
Gini	15	25.9	41.9	33.48	4.57
HDI	15	0.791	0.939	0.8938	0.0433
Happy	15	5.373	7.488	6.7034	0.5639
Net Mig.(K)	15	-370000	4774000	828133.3	1341853.8
Net Mig. Rate (per 1/K Pop.)	15	-3.8	16.3	3.57	4.59
Population (M)	15	604000	327096000	57536133.3	79582592.7
Population Dens.(Pop./sq KM)	15	3	511	178.1	134.6

Table 17. Descriptive Statistics of Basic Demographic Factors in ING/Ipsos Sample Countries

Foreign exchange-monetary/gold

The foreign exchange-monetary/gold factors were foreign exchange (forex) in USD, forex in CNY, forex in EUR, gold reserves, forex reserves with and without gold, percentage of gold reserves in forex reserves. The statistics are listed below for all (n=28) countries, with the 15 ING/Ipsos sample countries designated with an asterisk (a list of only ING/Ipsos sample countries is included in Appendix D). Descriptive analyses are provided for all sample countries and ING/Ipsos sample countries in subsequent tables.

Foreign Exchange-Monetary/Gold Factors in All Sample Countries							
Country	**ForExUSD**	**ForExCNY**	**ForExEUR**	**Gold Rsvs(T)**	**Rsvs-Gold(M)**	**Rsv/Gold(M)**	**Rsv Gold %**
Australia*	1.322	0.206	1.544	80.000	53259.014	56475.271	0.057
Netherld.*	0.856	0.133	1.000	612.454	12215.851	36838.462	0.668
Italy*	0.856	0.133	1.000	2451.837	49980.286	148552.009	0.664
United K.*	0.749	0.117	0.874	310.287	142966.009	155440.551	0.080
USA*	1.000	0.156	1.168	8133.462	114057.675	441049.007	0.741
Luxembg.*	0.856	0.133	1.000	2.239	824.896	914.928	0.098
Germany*	0.856	0.133	1.000	3369.880	59192.352	194672.357	0.696
Spain*	0.856	0.133	1.000	281.578	57712.845	69033.168	0.164
Austria*	0.856	0.133	1.000	279.991	12681.825	23938.376	0.470
Turkey*	4.601	0.717	5.373	281.578	57712.845	69033.168	0.164
Poland*	0.856	0.133	1.000	102.967	104814.664	108954.260	0.038
Belgium*	0.856	0.133	1.000	227.396	17125.484	26267.524	0.348
Romania*	0.856	0.133	1.000	103.698	36985.450	41154.451	0.101
France*	0.856	0.133	1.000	2436.036	65715.578	163652.073	0.598
Czech Rep.*	0.856	0.133	1.000	9.278	143809.982	144182.988	0.003
Argentina	24.972	3.889	29.163	61.739	59268.251	61750.340	0.040
Brazil	3.758	0.585	4.388	67.290	376783.114	379488.387	0.007
Canada	1.295	0.202	1.512	0.000	81764.649	81764.649	0.000
China	6.420	1.000	7.498	1842.555	3131516.990	3205593.648	0.023
India	66.978	10.432	78.219	566.225	385400.078	408164.138	0.056
Indonesia	13845.292	2156.438	16168.997	78.540	116681.859	119839.403	0.026
Japan	109.498	17.055	127.875	765.215	1227775.484	1258539.605	0.024
Mexico	19.866	3.094	23.200	120.242	173171.730	178005.844	0.027
South Korea	1072.150	166.990	1252.092	104.399	395418.762	399615.942	0.011
South Africa	12.646	1.970	14.768	125.315	45542.877	50580.940	0.100
Russia	62.098	9.672	72.520	1944.014	378567.985	456723.611	0.171
Saudi Arabia	3.750	0.584	4.379	323.067	506185.710	519174.061	0.025
Venezuela	9.988	1.556	11.664	161.220	1931.001	8412.583	0.500

Table 18. Foreign Exchange-Monetary/Gold Factors in All Sample Countries

Descriptive Statistics Foreign Exchange-Monetary/Gold Factors in All Sample Countries					
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
ForExUSD	28	0.749	13845.292	544.850	2614.427
ForExCNY	28	0.117	2156.438	84.862	407.203
ForExEUR	28	0.874	16168.997	636.294	3053.216
Gold Rsvs(T)	28	0.000	8133.462	887.232	1682.901
Rsvs FX ex-Gold(M)	28	824.896	3131516.990	278895.116	612375.443
Rsvs FX w-Gold(M)	28	914.928	3205593.648	314564.705	622178.660
Resvs Gold %	28	0.000	0.741	0.211	0.255

Table 19. Descriptive Statistics Foreign Exchange-Monetary/Gold Factors in All Sample Countries

Descriptive Statistics Foreign Exchange-Monetary/Gold Factors in ING/Ipsos Sample Countries					
	N	Minimum	Maximum	Mean	Std. Deviation
ForExUSD	15	0.749	4.601	1.139	0.966
ForExCNY	15	0.117	0.717	0.177	0.150
ForExEUR	15	0.874	5.373	1.331	1.128
Gold Rsvs(T)	15	2.239	8133.462	1245.512	2187.194
Rsvs FX ex-Gold(M)	15	824.896	143809.982	61936.984	45797.160
Rsvs FX w-Gold(M)	15	914.928	441049.007	112010.573	109195.924
Resvs Gold %	15	0.003	0.741	0.326	0.282

Table 20. Descriptive Statistics Foreign Exchange-Monetary/Gold Factors in ING/Ipsos Sample Countries

Independent variable #3 – trust in society and government

The trust factors for this research were based on two dimensions, trust in society (of three parts: generalized, in-group, and out-group) and general trust in governance and democracy. These data were drawn from the World Values Survey and the European Values Study in three simple questions and one six-part question. The exact verbiage of each question used is listed in Appendix B and C. The last metric used for this independent variable is the Democracy Index from the Economist Intelligence Unit. The statistics are listed below for all (n=28) countries with the 15 ING/Ipsos sample countries designated with an asterisk (a list of only ING/Ipsos sample countries is included in Appendix D). Descriptive analyses are provided for all sample countries and ING/Ipsos sample countries in subsequent tables.

Trust Factors of Society and Government in All Sample Countries										
Country	**Most Ppl Trusted**	**Trust in Family**	**Trust in Neighbor**	**People Known Person.**	**People Met for 1st Time**	**People of Another Religion**	**People of Another Nation.**	**How Imp. Live In Dem.**	**How Dem. is Country**	**EIU Dem. Index**
Brazil	7.10	3.61	2.45	2.54	1.62	2.48	1.96	8.07	5.57	6.97
Romania*	7.70	3.77	2.38	2.57	1.62	1.97	1.96	8.57	5.04	6.38
Turkey*	11.60	3.93	3.22	3.08	1.94	2.16	2.17	8.57	6.41	4.37
Mexico	12.40	3.74	2.43	2.52	1.56	1.94	1.79	8.54	6.19	6.19
India	16.70	3.90	3.19	3.06	2.02	2.52	2.04	7.77	6.60	7.23
Argentina	19.20	3.91	2.89	3.06	2.06	2.56	2.54	8.50	6.47	7.02
Spain*	19.90	3.92	3.05	3.26	2.23	2.45	2.45	8.64	6.64	8.08
Czch Rp.*	21.70	3.83	2.99	3.22	2.30	2.42	2.32	8.16	5.80	7.69
Poland*	22.20	3.67	2.81	2.96	2.07	2.54	2.55	8.70	5.89	6.67
S. Africa	23.30	3.71	2.91	2.75	2.26	2.55	2.42	7.55	6.72	7.24
S. Korea	26.50	3.80	2.79	2.94	1.91	2.29	2.13	8.31	5.87	8.00
France*	27.70	3.64	2.91	3.30	2.18	2.73	2.78	8.74	6.47	7.80
Russia	27.80	3.86	2.86	3.01	1.89	2.26	2.26	7.42	4.56	2.94
Italy*	27.90	3.84	2.87	2.81	2.09	2.51	2.53	9.20	6.04	7.71
USA*	34.80	3.65	2.76	3.21	2.20	2.71	2.66	8.41	6.46	7.96
Japan	35.90	3.73	2.60	2.95	1.83	1.82	2.01	8.27	6.72	7.99
Untd K.*	41.20	3.85	3.05	3.53	2.49	2.93	2.94	8.83	6.62	8.53
Germ.*	44.60	3.71	2.83	3.06	2.15	2.52	2.51	8.94	7.23	8.68
Austria*	47.00	3.83	3.11	3.31	2.31	2.52	2.58	9.11	7.42	8.29
Australia*	51.40	3.81	2.79	3.36	2.33	2.64	2.70	8.83	6.79	9.09
China	60.30	3.89	3.04	2.92	1.92	1.95	1.91	8.43	6.43	3.32
Nethrld.*	66.10	3.53	2.84	3.08	2.11	2.39	2.35	8.87	7.29	8.89
Luxemb.*	-	-	-	-	-	-	-	-	-	8.81
Belgium*	-	-	-	-	-	-	-	-	-	7.78
Canada	-	-	-	-	-	-	-	-	-	9.15
Indonesia	-	-	-	-	-	-	-	-	-	6.39
Saudi A.	-	-	-	-	-	-	-	-	-	1.93
Venez.	-	-	-	-	-	-	-	-	-	3.16

Table 21. Trust Factors of Society and Government in All Sample Countries

Trust Factors of Society and Governance in All Sample Countries					
	N	Min.	Max.	Mean	Std. Dev.
Most People Can Be Trusted	22	7.1	66.1	29.68	16.373
Trust in Family	22	3.5	3.9	3.78	0.112
Trust in Neighbors	22	2.4	3.2	2.85	0.229
Trust in People Known Personally	22	2.5	3.5	3.02	0.270
Trust in People Met for 1st Time	22	1.6	2.5	2.05	0.246
Trust in People of Another Religion	22	1.8	2.9	2.40	0.285
Trust in People of Another Nationality	22	1.8	2.9	2.34	0.313
How Important to Live in a Democracy	22	7.4	9.2	8.47	0.465
How Democratic is Your Country Today	22	4.6	7.4	6.33	0.687
EIU Democracy Index	28	1.9	9.2	6.94	1.999

Table 22. Trust Factors of Society and Governance in All Sample Countries

Trust Factors of Society and Governance in ING/Ipsos Sample Countries					
	N	Min.	Max.	Mean	Std. Dev.
Most People Can Be Trusted	13	7.7	66.1	32.60	16.836
Trust in Family	13	3.5	3.9	3.77	0.120
Trust in Neighbors	13	2.4	3.2	2.89	0.207
Trust in People Known Personally	13	2.6	3.5	3.14	0.254
Trust in People Met for 1st Time	13	1.6	2.5	2.16	0.212
Trust in People of Another Religion	13	2.0	2.9	2.50	0.245
Trust in People of Another Nationality	13	2.0	2.9	2.50	0.257
How Important to Live in a Democracy	13	8.2	9.2	8.74	0.280
How Democratic is Your Country Today	13	5.0	7.4	6.47	0.666
EIU Democracy Index	15	4.4	9.1	7.78	1.213

Table 23. Trust Factors of Society and Governance in ING/Ipsos Sample Countries

To better visualize these data, the following charts depict the spectrum of trust among the full sample of counties and the ING/Ipsos sample of countries. These continue to show contrasts between northern European countries and southeastern European countries, with the respondents from northern European countries expressing greater levels of trust, the southeastern countries expressing less. In light of the favorability of cryptocurrency in these low-trust countries, this suggests that trust is a large determinant of cryptocurrency perceptions and usage.

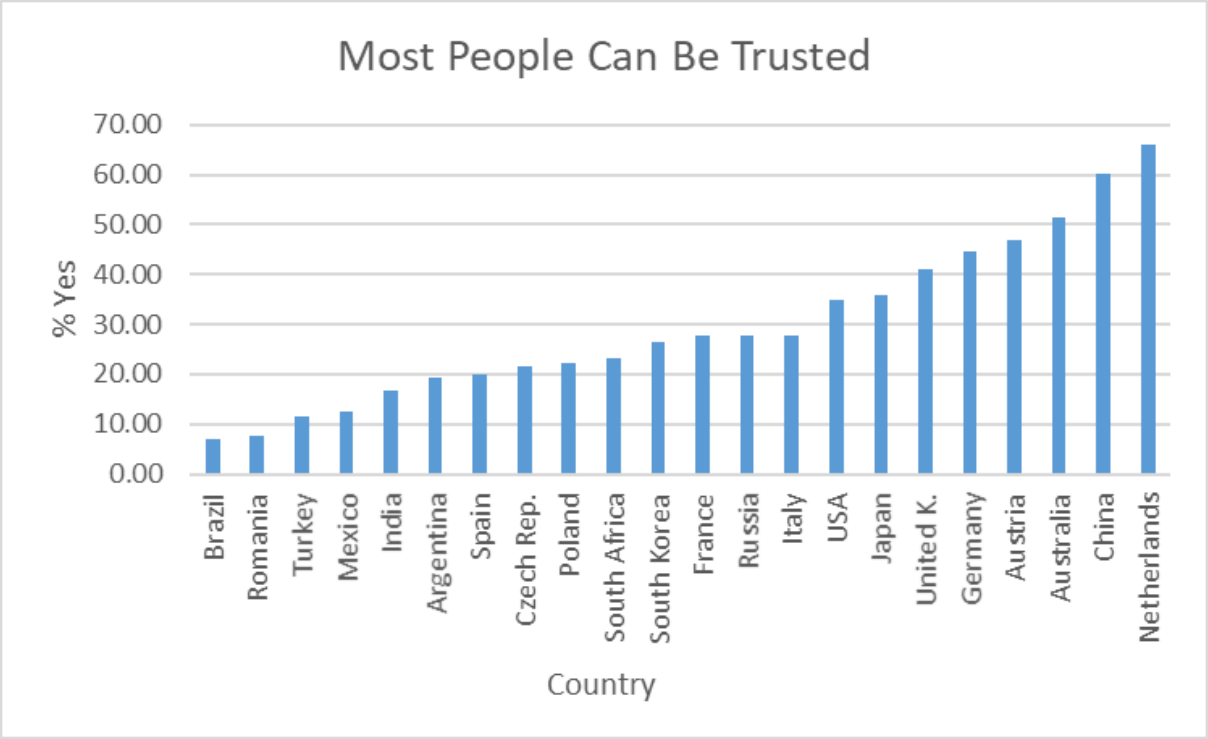

Chart 9. Most People Can be Trusted among All Sample Countries

While the generalized trust question chart above shows a stark range of trust among the sample countries, when trust is viewed in aggregate among in-group and out-group constituencies, there is a somewhat tighter range and pattern. In-group trust questions are those which measure how much trust individuals place in family and friends and acquaintances versus out-group constituencies like people of another religion or nation. Chart 10 depicts this aggregated trust and the range among all sample countries. This suggests there is a similar amount of trust that individuals in any culture have for specific types of groups; thus, there is only a difference among in-group and out-group, i.e., people either assign their total amount of trust among both in- and out-group evenly or reserve more of their trust for one or the other (in most cases it is reserved for in-group trust). This is discussed further below as it relates to Bitcoin and cryptocurrency.

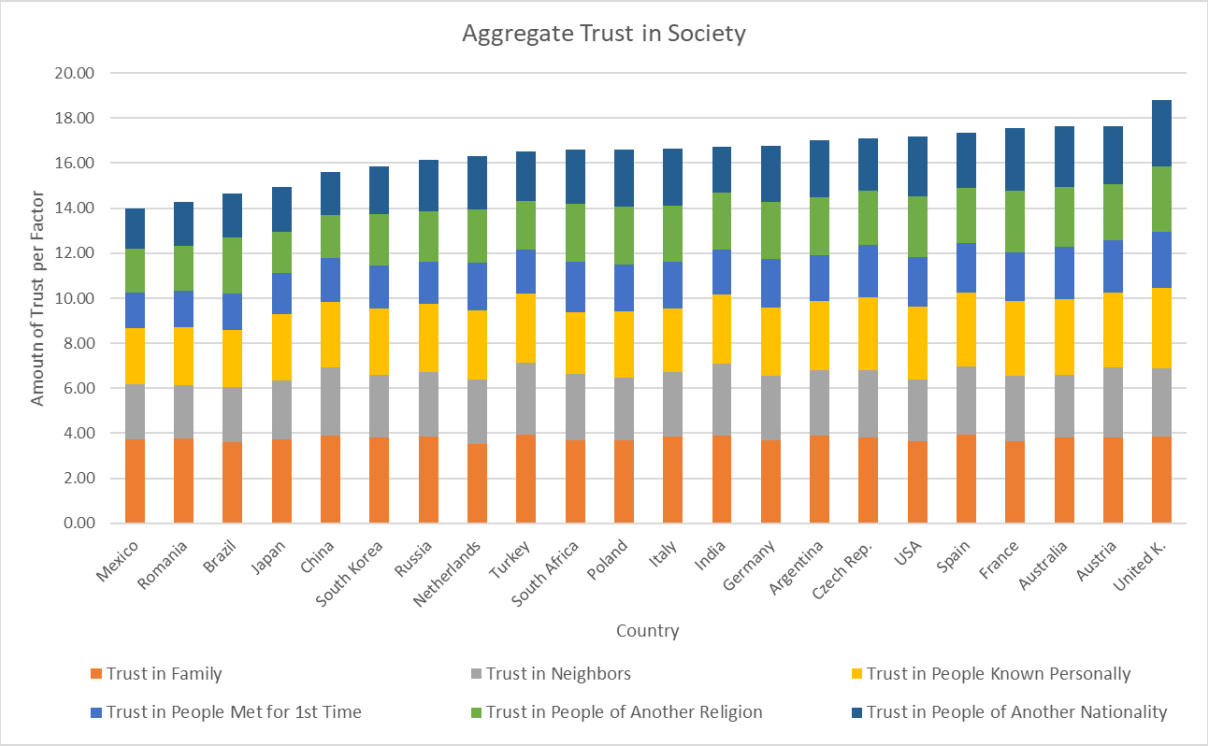

Chart 10. Aggregate Trust in Society among All Sample Countries

Finally, the metrics of democracy from the Economist Intelligence Unit and the WVS/EVS survey are depicted in Charts 11 and 12. They show a similar range and pattern when compared to the statistics regarding generalized trust: northern European and related countries have high democracy indices and perceptions, while southeastern European and other similar regions of the world have much lower democracy indices and perceptions. For the two WVS/EVS democracy perceptions questions, an aggregate was graphed to easily show an overall sense of democracy in the country by combining individual perceptions of democracy and individual beliefs in whether their own countries are democratic.

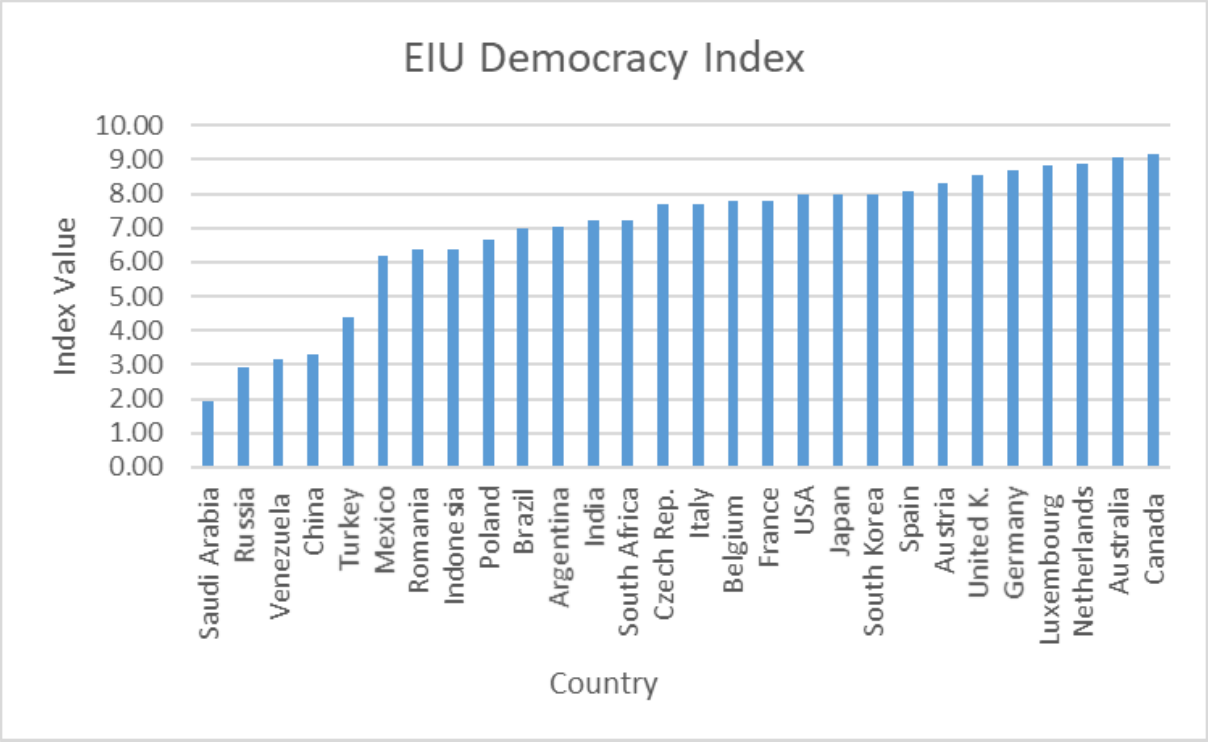

Chart 11. EIU Democracy Index for All Sample Countries

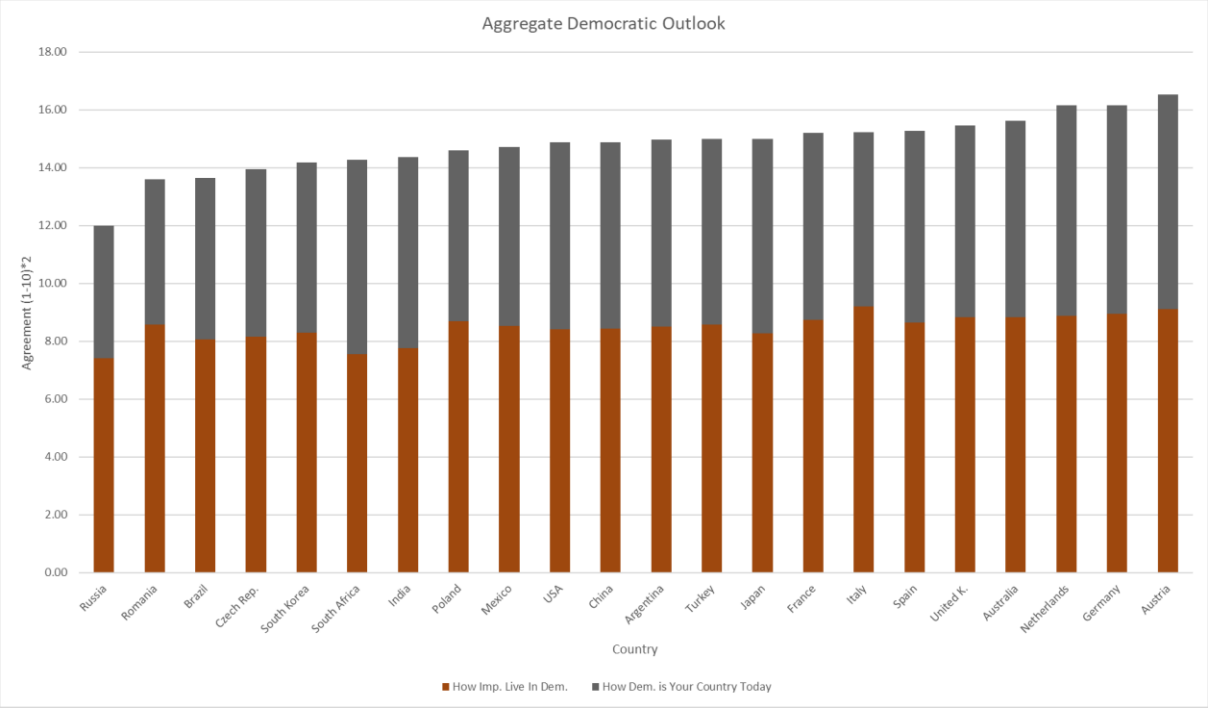

Chart 12. WVS/EVS Aggregate Democratic Outlook for All Sample Countries

Statistical analysis

Ordinary least squares (OLS) regression

The following hypotheses were tested with OLS regression testing:

Control: public policy

H1a: Countries with more restrictive policies regarding the use of Bitcoin and cryptocurrencies will have more negative perceptions of Bitcoin and cryptocurrencies.

H1b: Countries with more restrictive policies regarding the use of Bitcoin and cryptocurrencies will have lower usage of Bitcoin and cryptocurrencies.

Correlation analysis and basic scatterplot graphs were performed on the policy composite and the perception and usage metrics (ING/Ipsos metrics) to begin to analyze the data related to these two hypotheses to test for basic OLS analysis assumptions. There was no large (>0.5 absolute value) statistically significant correlation nor any scatterplot linear relationships between per-country policy and per-country metrics for any perception and usage metric. A correlation analysis was run for all other dependent variables (ATMs, Google search interest, nodes) to determine if the policy composite was related to any other usage type. Among all of these there was no measured large correlation with those measures as well. Numerous OLS regression runs were performed on all the dependent variables of perception and usage with public policy as the predictor, and no statistically significant relationship was detected.

As has been discussed above, the small sample size for the ING/Ipsos data (n=15) and the full sample of countries (n=28) exposes this research to the possibility of Type II error, so the lack of any detected relationship may be due to low statistical power. However, it was striking how little to no correlation was observed across so many metrics, even though there were detectable and strong statistical results for other metrics (for instance, those discussed below). In

any case, at the time of measurement in May 2018, this analysis found no evidence of any relationship between policy and perceptions and usage. Table 24 depicts the correlation analysis calculated for public policy about the dependent variables that shows some of the strongest – but not statistically significant – relationships.

Pearson Correlations of Cryptocurrency Perceptions and Usage to Public Policy											
	policy	**heard**	**own**	**expect**	**evangel**	**pragmat**	**skeptic**	**prospct**	**ATM**	**interest**	**nodes**
Pears.	1.000	-0.020	-0.038	-0.076	-0.257	0.198	0.250	-0.305	.429*	-0.112	.454*
Signif.		0.944	0.892	0.788	0.376	0.479	0.369	0.269	0.023	0.570	0.015
N	28	15	15	15	14	15	15	15	28	28	28
*. Correlation is significant at the 0.05 level (2-tailed).											
**. Correlation is significant at the 0.01 level (2-tailed).											

Table 24. Pearson Correlations of Cryptocurrency Perceptions and Usage to Public Policy

The lack of any relationship between overall governmental policy and user perceptions and usage is a curious result and unexpected. Over the course of this research and analysis, it has sometimes been considered that policy could be as much of a *dependent* variable as it is an *independent* variable because of the complex interplay between citizenry and policy (in varying degrees of democratic and autocratic regimes) about any topic, not the least of which is a rapidly emerging and changing topic like cryptocurrency. What these data suggest is that state policy does not change public opinion or behavior, and public opinion and behavior do not change state policy; the analysis provides no evidence that they are related, at least with this current arrangement of national policies as measured in May 2018. However, it may be that public policy is a lagging indicator to citizen sentiments, at least in heavily democratic regimes, or behavior in less democratic, more autocratic, regimes.

Of note, ATMs and nodes were by far the most correlated to policy (>0.04 Pearson correlation at 0.05 significance). This makes intuitive sense because these are both physical presences that would require permission from local, state/provincial, and national authorities to

operate. However, there was not a strong correlation between these measures. This might be due to deficiencies in the policy composite itself, though my review of the policy authority documents to measure this variable found no references to ATMs or nodes – specifically – in any public policy. The policies were silent on these practices.

Cultural: socio-economic development

H2a: Countries with more developed economies will have more positive perceptions of Bitcoin and cryptocurrencies.

H2b: Countries with more developed economies will have higher usage of Bitcoin and cryptocurrencies.

For this research, numerous measurements for economic development were included, but a PCA analysis identified only seven key variables: HDI, happiness, GDP, Gini coefficient for inequality, population, gold tonnes on reserve, and gold as a percentage of all foreign-exchange reserves. Correlation analysis for each of these seven metrics for all cryptocurrency perception and usage variables revealed a significant negative correlation between the HDI and happiness variables in relation to cryptocurrency perceptions and usage, namely Bitcoin evangelism and prospecting. Those same two variables were significant and *positive* for skepticism and pragmatism with respect to Bitcoin and cryptocurrency. This mirrored direction of correlation for the same variables with respect to the two personality types that are favorable and the personality types that are unfavorable to Bitcoin makes sense and confirms that the personality types are characterizing the perceptions and usage accurately, and oppositionally.

Interestingly, there is no large correlation between having heard of cryptocurrency or having search interest in cryptocurrency and any country-level economic development metric, nor is there any large correlation between the perception and use of Bitcoin as a speculative

investment and any such economic development metric. Of note, GDP and tonnes of gold reserves (but, notably, not gold as a percentage of all foreign exchange reserves) are only correlated with the numbers of ATMs and Bitcoin mining nodes.

In summary, this correlation analysis suggests economic development factors of HDI, happiness, and the Gini coefficient for inequality are negatively correlated with the favorability of perceptions of cryptocurrency. Table 24 shows the correlation analysis of these metrics and Table 25 shows an analysis of the interrelated correlation between the economic development metrics. Pearson correlations of greater than an absolute value of 0.5 are highlighted in yellow.

Pearson Correlations of Cryptocurrency Perceptions and Usage to Happiness												
		happiness	heard	own	expect	evangelist	pragmatist	skeptic	prospector	ATM	interest	nodes
happiness	Pearson Corr.	1	-0.288	-.810**	-.890**	-.945**	.891**	.754**	-0.281	0.223	-0.190	0.300
	Sig. (2-tailed)		0.298	0.000	0.000	0.000	0.000	0.001	0.311	0.253	0.333	0.121
	N	28	15	15	15	15	15	15	15	28	28	28
Pearson Correlations of Cryptocurrency Perceptions and Usage to GDP												
		GDP	heard	own	expect	evangelist	pragmatist	skeptic	prospector	ATM	interest	nodes
GDP	Pearson Corr.	1	-0.239	-0.107	-0.077	0.001	-0.147	0.328	-0.119	.783**	-0.136	.729**
	Sig. (2-tailed)		0.391	0.705	0.786	0.997	0.601	0.233	0.674	0.000	0.490	0.000
	N	28	15	15	15	15	15	15	15	28	28	28
Pearson Correlations of Cryptocurrency Perceptions and Usage to Gini												
		Gini	heard	own	expect	evangelist	pragmatist	skeptic	prospector	ATM	interest	nodes
Gini	Pearson Corr.	1	0.210	0.470	.579*	.622*	-.590*	-0.192	-0.297	0.064	.485*	-0.096
	Sig. (2-tailed)		0.453	0.077	0.024	0.013	0.021	0.494	0.282	0.752	0.010	0.634
	N	27	15	15	15	15	15	15	15	27	27	27
Pearson Correlations of Cryptocurrency Perceptions and Usage to Population												
		population	heard	own	expect	evangelist	pragmatist	skeptic	prospector	ATM	interest	nodes
population	Pearson Corr.	1	-0.185	0.071	0.100	0.181	-0.300	0.184	-0.104	0.053	-0.048	0.067
	Sig. (2-tailed)		0.509	0.801	0.724	0.519	0.277	0.511	0.712	0.788	0.808	0.736
	N	28	15	15	15	15	15	15	15	28	28	28
Pearson Correlations of Cryptocurrency Perceptions and Usage to Reserve Tonnes of Gold												
		resvs tonnes	heard	own	expect	evangelist	pragmatist	skeptic	prospector	ATM	interest	nodes
resvs tonnes	Pearson Corr.	1	-0.237	-0.136	-0.079	0.031	-0.146	0.232	-0.071	.811**	-0.161	.890**
	Sig. (2-tailed)		0.396	0.628	0.780	0.913	0.605	0.406	0.800	0.000	0.413	0.000
	N	28	15	15	15	15	15	15	15	28	28	28
Pearson Correlations of Cryptocurrency Perceptions and Usage to Reserve Gold %												
		resvs gold %	heard	own	expect	evangelist	pragmatist	skeptic	prospector	ATM	interest	nodes
resvs gold % of total	Pearson Corr.	1	-0.345	-0.254	-0.237	-0.143	0.148	0.185	-0.218	.386*	-0.025	.621**
	Sig. (2-tailed)		0.208	0.361	0.395	0.612	0.600	0.510	0.435	0.043	0.900	0.000
	N	28	15	15	15	15	15	15	15	28	28	28
*. Correlation is significant at the 0.05 level (2-tailed).												
**. Correlation is significant at the 0.01 level (2-tailed).												

Table 25. Pearson Correlations of Cryptocurrency Perceptions and Usage to Cultural Metrics

Pearson Correlations of Economic Development Metrics								
		GDP	Gini	HDI	happiness	population	resvs tonnes	resvs gld %
GDP	Pearson Co	1	0.061	0.078	-0.004	.496**	.837**	0.299
	Sig. (2-tld)		0.763	0.692	0.986	0.007	0.000	0.123
	N	28	27	28	28	28	28	28
Gini	Pearson Co	0.061	1	-.635**	-.490**	0.081	-0.006	-0.169
	Sig. (2-tld)	0.763		0.000	0.009	0.688	0.975	0.398
	N	27	27	27	27	27	27	27
HDI	Pearson Co	0.078	-.635**	1	.862**	-.549**	0.232	0.365
	Sig. (2-tld)	0.692	0.000		0.000	0.002	0.234	0.056
	N	28	27	28	28	28	28	28
happiness	Pearson Co	-0.004	-.490**	.862**	1	-.540**	0.126	0.272
	Sig. (2-tld)	0.986	0.009	0.000		0.003	0.522	0.161
	N	28	27	28	28	28	28	28
population	Pearson Co	.496**	0.081	-.549**	-.540**	1	0.184	-0.166
	Sig. (2-tld)	0.007	0.688	0.002	0.003		0.349	0.399
	N	28	27	28	28	28	28	28
resvs tonnes	Pearson Co	.837**	-0.006	0.232	0.126	0.184	1	.648**
	Sig. (2-tld)	0.000	0.975	0.234	0.522	0.349		0.000
	N	28	27	28	28	28	28	28
resvs gold % of total	Pearson Co	0.299	-0.169	0.365	0.272	-0.166	.648**	1
	Sig. (2-tld)	0.123	0.398	0.056	0.161	0.399	0.000	
	N	28	27	28	28	28	28	28
**. Correlation is significant at the 0.01 level (2-tailed).								

Table 26. Pearson Correlations of Economic Development Metrics

Because of the strong mutual correlations among the economic development independent variable metrics (HDI, Happiness, and Gini) and the overlapping correlations of the perception and usage dependent variable metrics, the following three pairs of independent/dependent variables were isolated as the most relevant and regressed with an OLS model: HDI/Skeptic, Happiness/Evangelist, and Gini/Evangelist. The results of these regressions are provided in Tables 27, 28, and 29:

HDI/Skeptic Regression Model Summary[b]										
					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.837[a]	0.700	0.677	0.18804	0.700	30.344	1	13	0.000	1.961
a. Predictors: (Constant), HDI										
b. Dependent Variable: skeptic										

HDI/Skeptic Regression Model Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-4.260	1.038		-4.102	0.001	-6.503	-2.016
	HDI	6.393	1.161	0.837	5.509	0.000	3.886	8.900
a. Dependent Variable: skeptic								

Table 27. HDI/Skeptic Regression Model

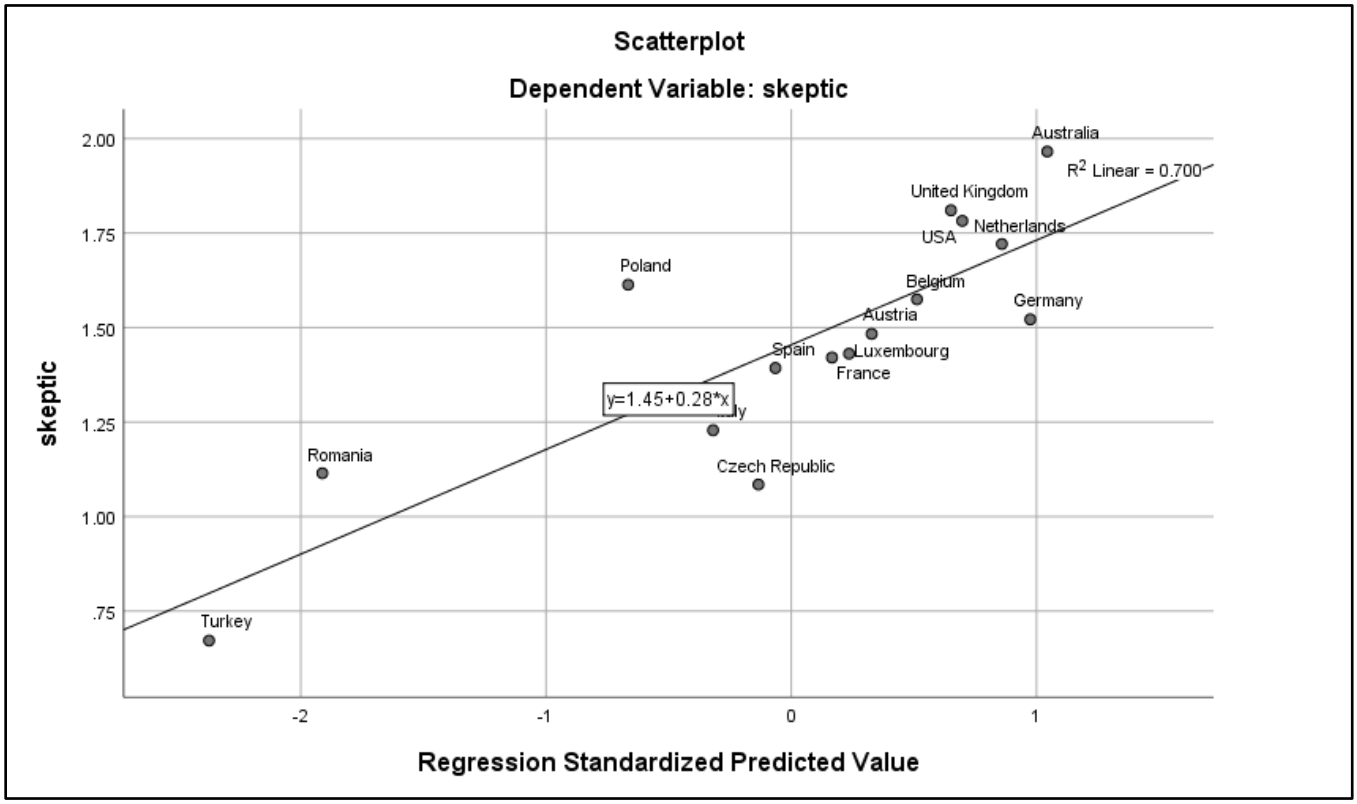

Chart 13. HDI/Skeptic Regression Model Scatterplot

Happiness/Evangelist Model Summary[b]										
					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.945[a]	0.894	0.886	0.20172	0.894	109.363	1	13	0.000	2.500
a. Predictors: (Constant), happiness										
b. Dependent Variable: evangelist										

Happiness/Evangelist Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	8.016	0.643		12.466	0.000	6.626	9.405
	happiness	-1.000	0.096	-0.945	-10.458	0.000	-1.206	-0.793
a. Dependent Variable: evangelist								

Table 28. Happiness/Evangelist Regression Model

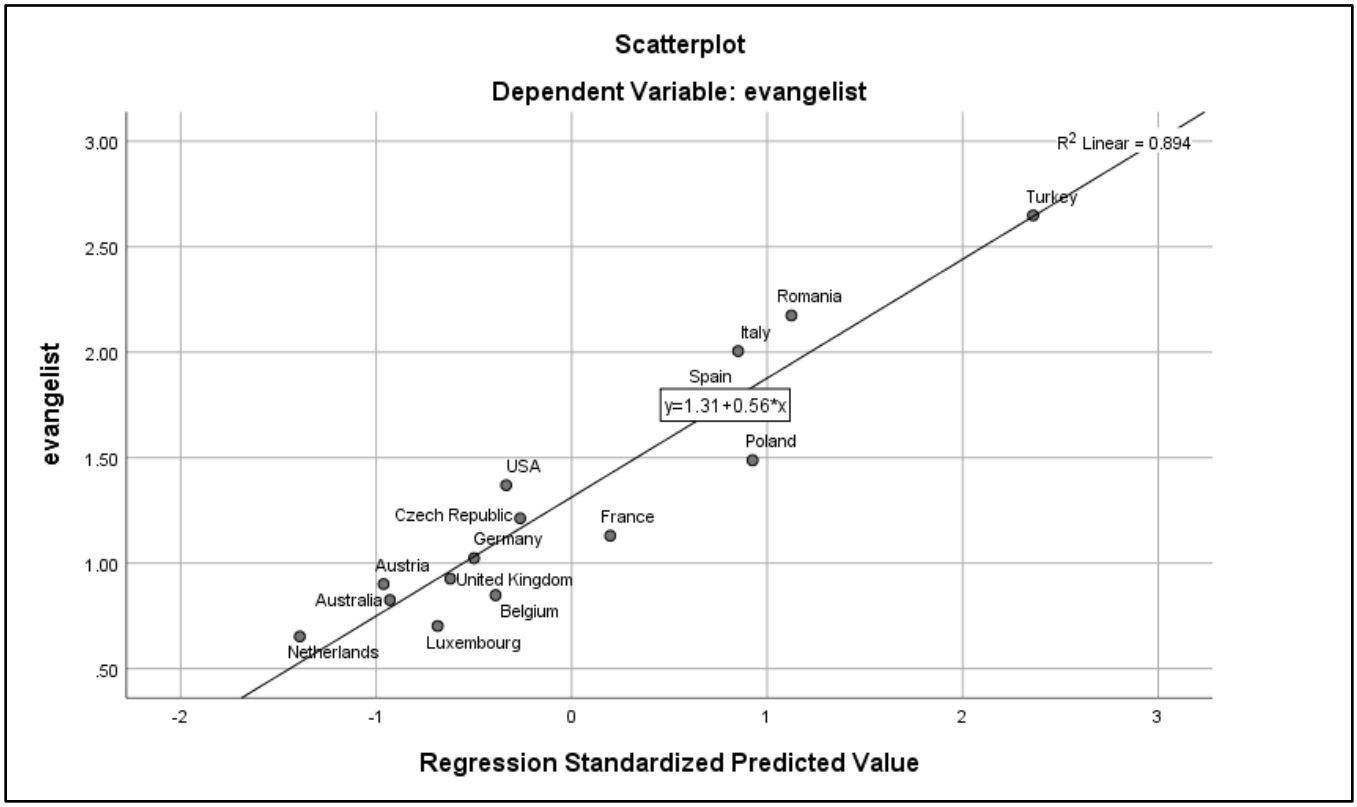

Chart 14. Happiness/Evangelist Regression Model Scatterplot

Gini/Evangelist Model Summary[b]										
					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.622[a]	0.387	0.340	0.48438	0.387	8.222	1	13	0.013	2.010
a. Predictors: (Constant), Gini										
b. Dependent Variable: evangelist										

Gini/Evangelist Coefficients[a]								
		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	-1.408	0.957		-1.471	0.165	-3.476	0.660
	Gini	0.081	0.028	0.622	2.867	0.013	0.020	0.143
a. Dependent Variable: evangelist								

Table 29. Gini/Evangelist Regression Model

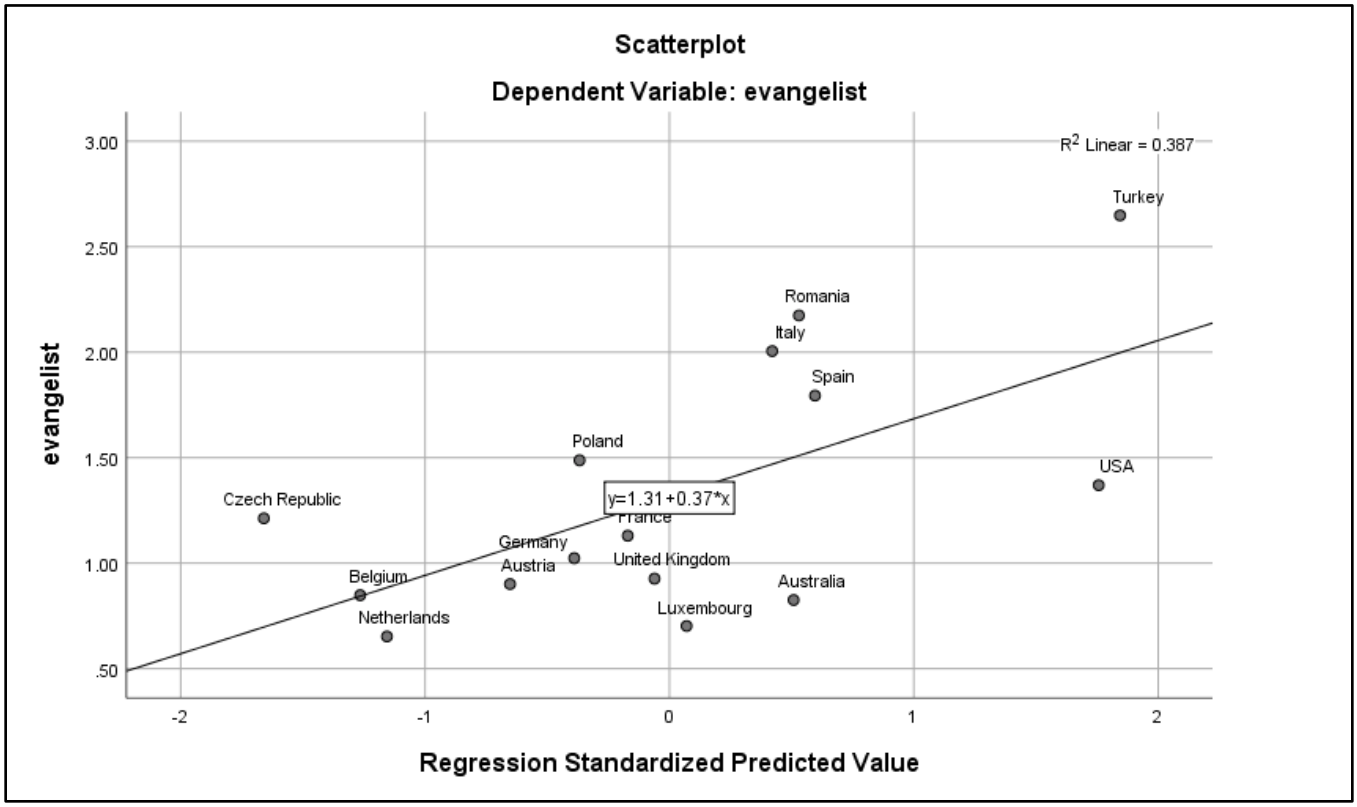

Chart 15. Gini/Evangelist Regression Model Scatterplot

Trust: attitudes of trust in society and of government

H3a: Countries with lower levels of trust in government will have more positive perceptions of Bitcoin and cryptocurrencies.

H3b: Countries with lower levels of trust in government will have higher usage of Bitcoin and cryptocurrencies.

For this research, there were several measurements for trust, but a PCA analysis yielded only eight significant components: generalized trust, in-group trust, out-group trust, desire to live in a democracy, belief in current democratic governance, confidence in current government, and the EIUDI democracy index. A correlation analysis between each of these eight metrics and all cryptocurrency perception and usage variables revealed a significant and large negative correlation between two trust variables – generalized trust and out-group trust – and cryptocurrency perceptions and usage. Those same metrics are significant, large, and positive for skepticism and pragmatism with respect to Bitcoin and cryptocurrency. The Economist Intelligence Unit Democracy Index (EIUDI) democracy measurement is also significant and strongly negative in its correlation with favorable cryptocurrency perceptions and usage.

Table 30 shows the correlation analysis of these metrics and Table 31 shows an analysis of the interrelated correlation between the actual independent variables of trust metrics. Pearson correlations of greater than an absolute value of 0.5 are highlighted in yellow.

Pearson Correlations of Bitcoin and Cryptocurrency Perceptions and Usage to Generalized Trust												
		gen trst	heard	own	exp.	evang.	pragmat.	skeptic	prospect	ATM	interst	nodes
gen trust	Pearson Co	1	-0.305	-.669*	-.799**	-.848**	.901**	.735**	-.601*	0.094	-0.317	0.339
	Sig. (2-tld)		0.310	0.012	0.001	0.000	0.000	0.004	0.030	0.676	0.151	0.123
	N	22	13	13	13	13	13	13	13	22	22	22
Pearson Correlations of Bitcoin and Cryptocurrency Perceptions and Usage to In-group Trust												
		in-grp	heard	own	Exp	evang.	pragmat.	skeptic	prospect	ATM	interst	nodes
in-group	Pearson Co	1	-0.081	-0.094	-0.205	-0.200	0.321	0.037	-0.045	0.029	-0.311	0.016
	Sig. (2-tld)		0.792	0.761	0.502	0.513	0.285	0.903	0.883	0.897	0.159	0.945
	N	22	13	13	13	13	13	13	13	22	22	22
Pearson Correlations of Bitcoin and Cryptocurrency Perceptions and Usage to Out-group Trust												
		out-grp	heard	own	exp.	evang.	pragmat.	skeptic	prospect	ATM	interst	nodes
out-group	Pearson Co	1	-0.387	-.739**	-.751**	-.661*	.569*	.685**	-0.260	0.266	-0.236	0.295
	Sig. (2-tld)		0.191	0.004	0.003	0.014	0.042	0.010	0.391	0.232	0.290	0.182
	N	22	13	13	13	13	13	13	13	22	22	22
Pearson Correlations of Bitcoin and Cryptocurrency Perceptions and Usage to Importance of Living in a Democracy												
		livedem	heard	own	exp.	evang.	pragmat.	skeptic	prospect	ATM	interst	nodes
livedem	Pearson Co	1	0.150	-0.323	-0.257	-0.220	0.339	0.276	-.634*	0.006	0.024	0.157
	Sig. (2-tld)		0.625	0.282	0.397	0.470	0.258	0.361	0.020	0.980	0.916	0.484
	N	22	13	13	13	13	13	13	13	22	22	22
Pearson Correlations of Bitcoin and Cryptocurrency Perceptions and Usage to Belief in Current Country as a Democracy												
		govdem	heard	own	exp.	evang.	pragmat.	skeptic	prospect	ATM	interst	nodes
govdem	Pearson Co	1	-0.224	-0.391	-0.505	-.612*	.755**	0.452	-0.504	0.065	-0.146	0.257
	Sig. (2-tld)		0.463	0.187	0.079	0.026	0.003	0.121	0.079	0.774	0.515	0.249
	N	22	13	13	13	13	13	13	13	22	22	22
Pearson Correlations of Bitcoin and Cryptocurrency Perceptions and Usage to Confidence in Current Government												
		con gov	heard	own	exp.	evang.	pragmat.	skeptic	prospect	ATM	interst	nodes
confid in govt	Pearson Co	1	-0.037	0.314	0.137	0.065	0.188	-0.153	-0.335	-0.033	-0.023	0.089
	Sig. (2-tld)		0.905	0.295	0.656	0.833	0.539	0.617	0.263	0.882	0.921	0.693
	N	22	13	13	13	13	13	13	13	22	22	22
Pearson Correlations of Cryptocurrency Perceptions and Usage to EIU Democracy Index												
		EIUDI	heard	own	exp.	evang.	pragmat.	skeptic	prospect	ATM	interst	nodes
EIUDI	Pearson Co	1	-0.225	-.876**	-.844**	-.850**	.764**	.772**	-0.351	0.163	-0.315	0.235
	Sig. (2-tld)		0.421	0.000	0.000	0.000	0.001	0.001	0.199	0.407	0.102	0.228
	N	28	15	15	15	15	15	15	15	28	28	28
*. Correlation is significant at the 0.05 level (2-tailed).												
**. Correlation is significant at the 0.01 level (2-tailed).												

Table 30. Pearson Correlations of Cryptocurrency Perceptions and Usage to Trust Metrics

Pearson Correlations of Trust Metrics									
		gen trust	in-grp	out-grp	livedem	govdem	live gov dem	con. govt	EIUDI
gen trust	Pearson Corr.	1	0.330	0.323	0.376	.572**	.572**	0.347	0.239
	Sig. (2-tailed)		0.134	0.143	0.084	0.005	0.005	0.114	0.284
	N	22	22	22	22	22	22	22	22
in-group	Pearson Corr.	0.330	1	.624**	0.160	0.397	0.350	0.211	0.086
	Sig. (2-tailed)	0.134		0.002	0.478	0.067	0.110	0.346	0.702
	N	22	22	22	22	22	22	22	22
out-group	Pearson Corr.	0.323	.624**	1	0.324	0.409	.433*	-0.282	.542**
	Sig. (2-tailed)	0.143	0.002		0.142	0.059	0.044	0.203	0.009
	N	22	22	22	22	22	22	22	22
livedem	Pearson Corr.	0.376	0.160	0.324	1	.476*	.793**	-0.246	.464*
	Sig. (2-tailed)	0.084	0.478	0.142		0.025	0.000	0.270	0.030
	N	22	22	22	22	22	22	22	22
govdem	Pearson Corr.	.572**	0.397	0.409	.476*	1	.913**	0.179	.579**
	Sig. (2-tailed)	0.005	0.067	0.059	0.025		0.000	0.425	0.005
	N	22	22	22	22	22	22	22	22
confid in govt	Pearson Corr.	0.347	0.211	-0.282	-0.246	0.179	0.011	1	-.545**
	Sig. (2-tailed)	0.114	0.346	0.203	0.270	0.425	0.961		0.009
	N	22	22	22	22	22	22	22	22
EIUDI	Pearson Corr.	0.239	0.086	.542**	.464*	.579**	.614**	-.545**	1
	Sig. (2-tailed)	0.284	0.702	0.009	0.030	0.005	0.002	0.009	
	N	22	22	22	22	22	22	22	28
**. Correlation is significant at the 0.01 level (2-tailed).									
*. Correlation is significant at the 0.05 level (2-tailed).									

Table 31. Pearson Correlations of Trust Metrics

Because of the strong mutual correlations among the trust independent variable metrics and the overlapping correlations of the perception and usage dependent variable metrics, the following three pairs of IV/DV were isolated as the most relevant and regressed with an OLS model: Generalized Trust/Evangelist, Out-group Trust/Evangelist, and EIUDI/Evangelist. The results of these regressions are provided in Tables 32, 33, and 34:

Generalized Trust/Evangelist Regression Model Summary[b]										
				Std. Error of the Estimate	Change Statistics					Durbin-Watson
Model	R	R Square	Adjusted R Square		R Sq Chg	F Chg	df1	df2	Sig F Chg	
1	.848[a]	0.719	0.694	0.33117	0.719	28.208	1	11	0.000	1.711
a. Predictors: (Constant), gen trust										
b. Dependent Variable: evangelist										

Generalized Trust/Evangelist Regression Model Coefficients[a]						
Model		Unstnd Coeff.		Stnd Coeff	t	Sig.
		B	Std. Err.	Beta		
1	(Constant)	2.379	0.207		11.514	0.000
	gen trust	-0.030	0.006	-0.848	-5.311	0.000
a. Dependent Variable: evangelist						

Table 32. Generalized Trust/Evangelist Regression Model

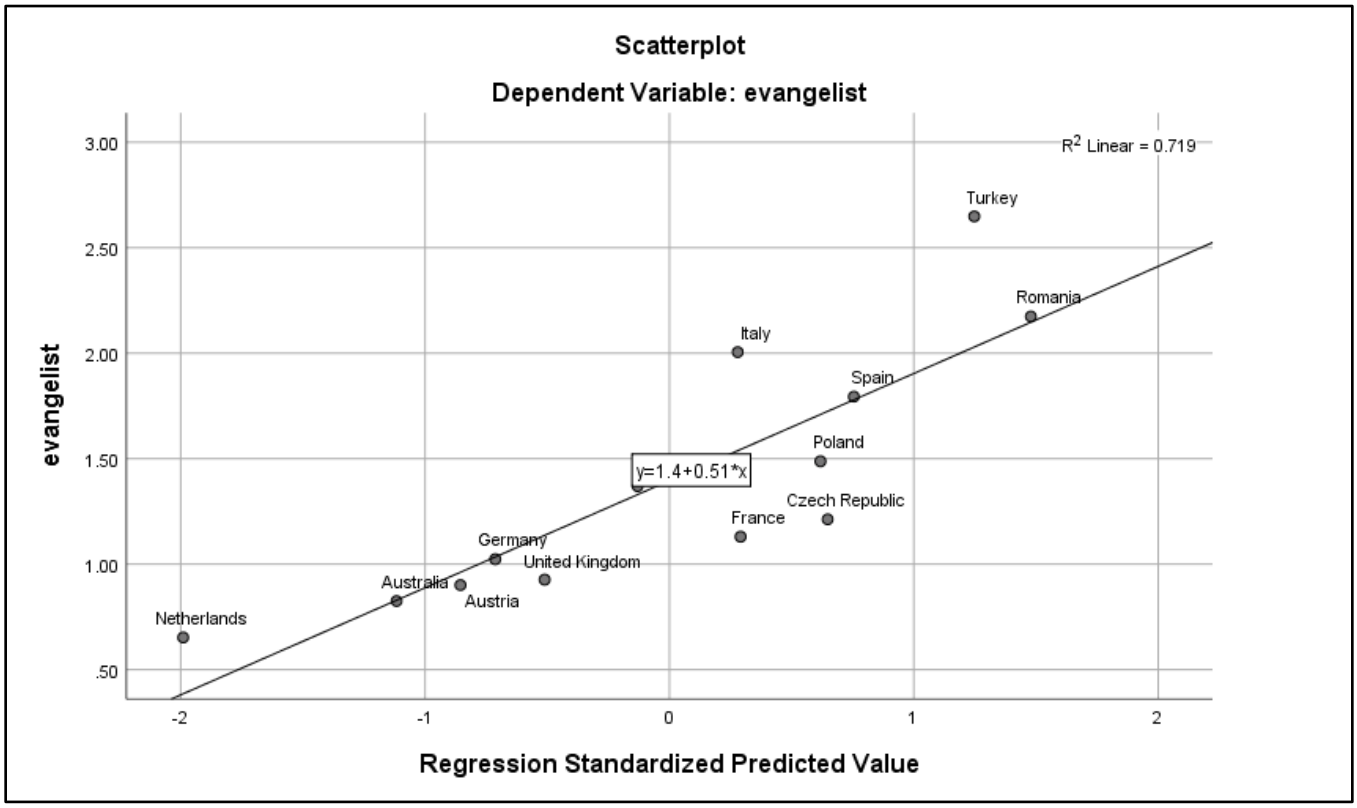

Chart 16. Generalized Trust/Evangelist Regression Model Scatterplot

Out-group Trust\Evangelist Regression Model Summary[b]										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Sq Chg	F Chg	df1	df2	Sig F Chg	
1	.661[a]	0.437	0.385	0.46933	0.437	8.522	1	11	0.014	2.169
a. Predictors: (Constant), out-group										
b. Dependent Variable: evangelist										

Out-group Trust\Evangelist Regression Model Coefficients[a]						
Model		Unstnd Coeff		Stnd Coeff	t	Sig.
		B	Std. Err	Beta		
1	(Constant)	5.516	1.417		3.892	0.003
	out-group	-0.576	0.197	-0.661	-2.919	0.014
a. Dependent Variable: evangelist						

Table 33. Out-group Trust\Evangelist Regression Model

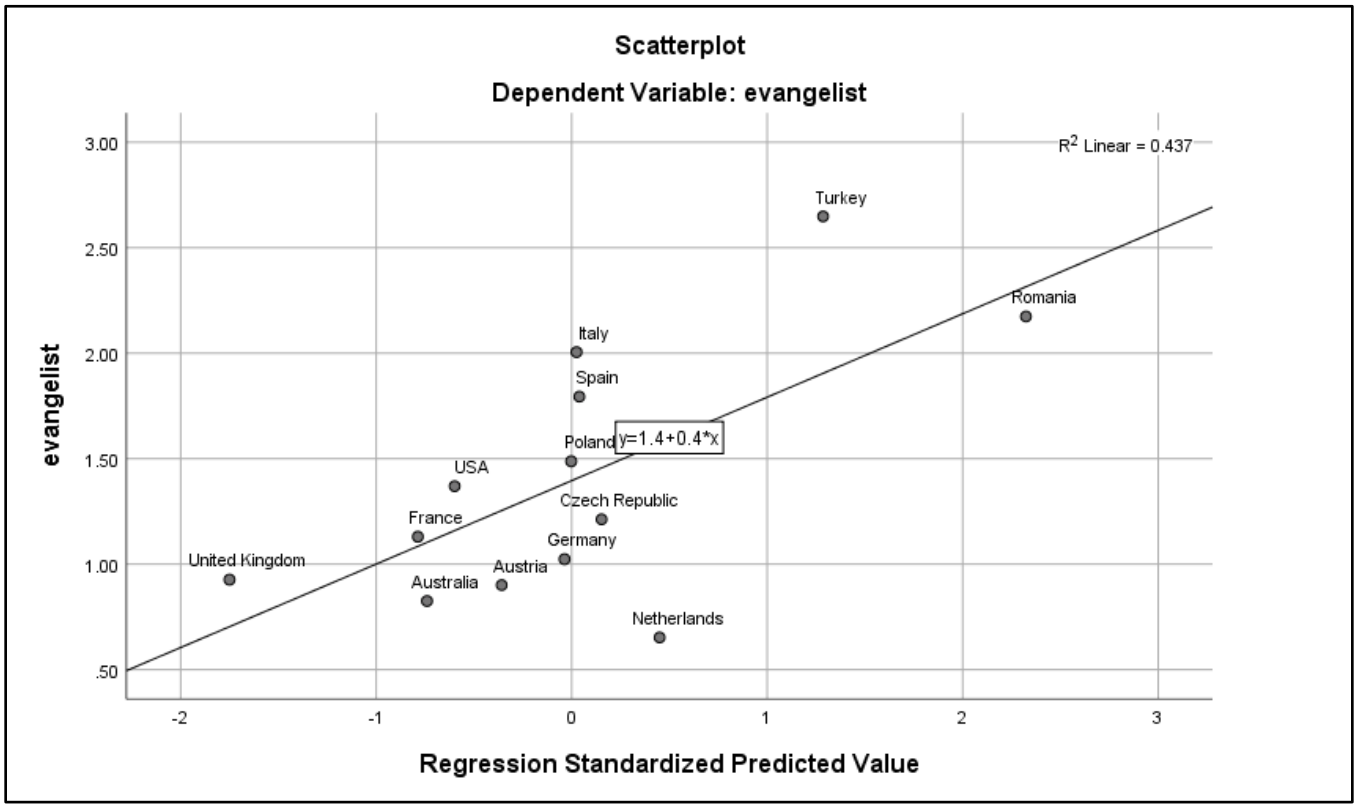

Chart 17. Out-group Trust\Evangelist Regression Model Scatterplot

EIUDI/Evangelist Regression Model Summary[b]										
Model	R	R Square	Adjusted R Square	Std. Err. of the Est	Change Statistics					Durbin-Watson
					R Sq Chg	F Chg	df1	df2	Sig F Chg	
1	.850[a]	0.722	0.700	0.32648	0.722	33.713	1	13	0.000	1.675
a. Predictors: (Constant), EIUDI										
b. Dependent Variable: evangelist										

EIUDI/Evangelist Regression Model Coefficients[a]						
Model		Unstd Coeff		Std Coeff	t	Sig.
		B	Std. Err.	Beta		
1	(Constant)	4.564	0.566		8.062	0.000
	EIUDI	-0.418	0.072	-0.850	-5.806	0.000
a. Dependent Variable: evangelist						

Table 34. EIUDI/Evangelist Regression Model

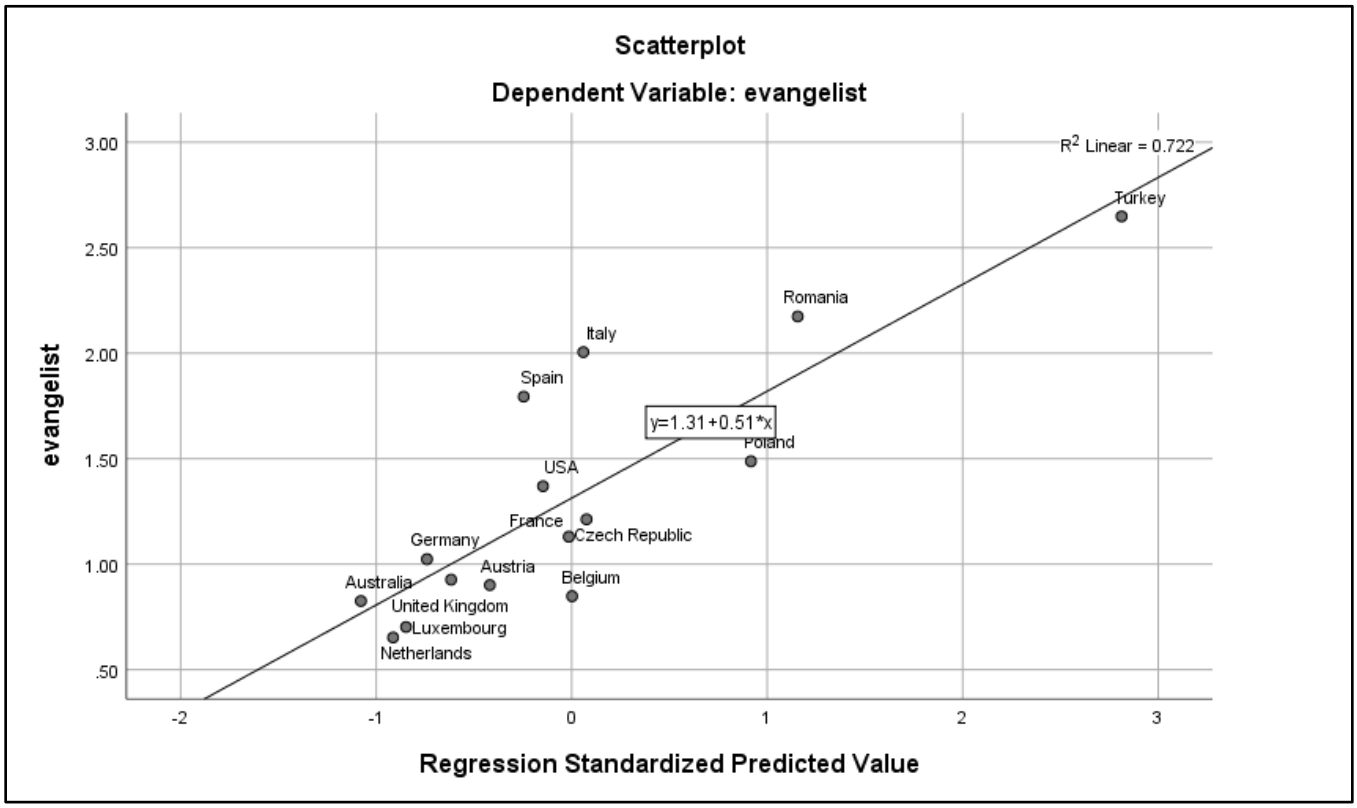

Chart 18. EIUDI/Evangelist Regression Model Scatterplot

Resultant conceptual process model

The variable model in Figure 8 below is based on the initial conceptual model (Figure 7) used to guide the methodology, which it is now possible to revisit with deeper consideration following the analysis above.

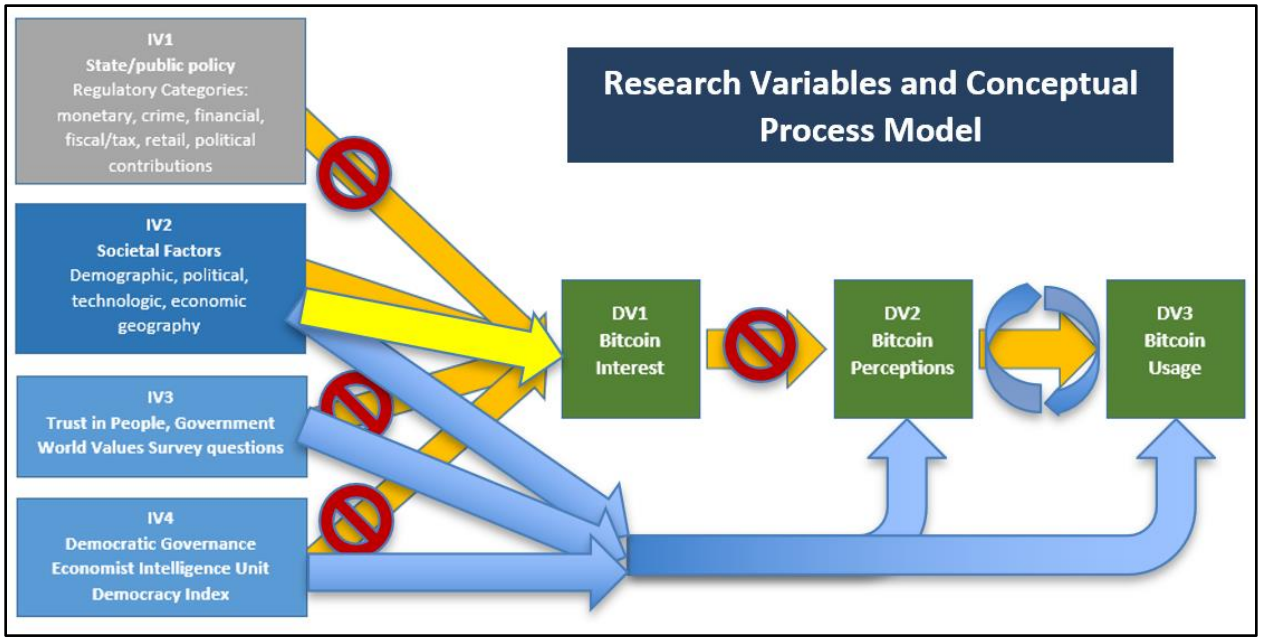

Figure 8. Resultant Conceptual Process Model of Variables

First, there were only three large, significant (>0.5 Pearson/<0.01 significance) correlations to Google search activity (DV1, Bitcoin Interest) among any of the collected IVs, which were numerous and widely covered the public policy, economic development, and trust spectrums. The three IVs highly correlated to Google search interest were Online Readiness (UN-generated index of internet e-commerce preparedness) and two crime-related metrics (OECD Better Life Index components of homicide rate and "feel safe at night"). These three IVs were not generally correlated with other DVs, so the full nature of their relationship to Google search interest may not extend beyond the noted correlation but is presented here as part of the

exploration of this field. There were a series of other IVs that were slightly less significantly (>0.4 Pearson/<0.05 significance) correlated to Google search interest than the three discussed above and they were: higher Gini coefficient of inequality, lower net migration (lower immigration), lower density, lower in-group trust, lower confidence in the armed forces, police, and courts. Table 35 depicts all the significant IV correlations to Google search interest.

Strong and Statistically Significant Pearson Correlations Between Selected Independent Variables and Google Search Interest in Bitcoin											
		Int.	Gini	Online Readi.	Crime Homi.	Crime Feel Sfe	Net Mig. Rt	Dens.	Confid. arm frc	Confid. police	Confid. courts
Int.	Pearson Co	1	.485*	-.536**	.756**	-.618**	-.451*	-.410*	-.473*	-.448*	-.431*
	Sig. (2-tld)		0.010	0.003	0.000	0.004	0.016	0.030	0.026	0.036	0.045
	N	28	27	28	20	20	28	28	22	22	22
*. Correlation is significant at the 0.05 level (2-tailed).											
**. Correlation is significant at the 0.01 level (2-tailed).											

Table 35. Pearson Correlations of IVs to Google Search Interest in Bitcoin

Despite these correlations, interest in Bitcoin as measured by Google search interest was not correlated (no >0.5 correlation at <0.05 significance) to any perceptions and usage measures, i.e., Bitcoin search interest was not correlated to perceptions and usage. However, many of the perception and usage measures were positively or negatively correlated with each other, i.e., they were related somehow. So, while Google search interest has some clear correlations to low socio-economic development metrics, search interest was not measured to be correlated to any other DVs. Perhaps this is because search interest is mutually exclusive from perceptions and use, a research finding, or, perhaps, countries with lower socio-economic metrics have reason to seek more information about Bitcoin but were not included in the ING/Ipsos survey sample, and so these countries' data were not available to analyze alongside other metrics, a methodological weakness. Either way, it appears to be an area warranting more study, but this is a speculative assessment based on correlations only, and the limitation of the sample size available for detailed

perceptions and usage metrics must be underscored. However, while considering this process model, it should be noted that the Bitcoin interest variable is correlated with a series of metrics that are suggestive of lower socio-economic status and anti-establishment tendencies. Indeed, the reason the full sample of 28 countries was chosen was to include countries like Venezuela and Brazil, which both rank high in the areas of these positively correlated search interest results, thus helping to validate this research methodology.

Conclusion

Summary

Digital currencies like Bitcoin and other cryptocurrencies have a complex but technologically solid foundation. Their rapid growth over the past decade has challenged the view of currency as a "universal equivalent" and given new life to the argument that currency systems are social constructs. Given their potential for adoption at a massive, global scale, and their ability to thwart state fiscal and monetary policy – including international sanctions – understanding how individuals from around the world perceive and use digital currency, and what social, economic, and policy factors influence those perceptions and levels of usage, is imperative. This research begins to improve the quality of the debate about Bitcoin and cryptocurrency, which has thus far seen a paucity of social science research, by seeking to explain the social, economic, and policy factors that underlie perceptions and usage of these new currency types.

First, this research developed a novel theoretical matrix of *trust* and *control* to explain currency systems in general and the conditions under which people have chosen to use extant monetary systems. Then, this research tested this theory with a quantitative analysis of policy, trust, socio-economic, and cultural factors affecting the perceptions and usage of a type of new

currency system – cryptocurrency – in samples of 15 countries (using the ING/Ipsos individual-level data) and 28 countries (using country-level data). The results support that matrix of trust and control as predicting where Bitcoin and other cryptocurrencies are situated in the landscape of all socio-economic values and especially relative to other currency systems.

Because Bitcoin relies on zero trust (in the sense of social trust – one only has to "trust" the mathematics of cryptography), the theory predicts that countries with more individuals with more favorable perceptions of Bitcoin and cryptocurrencies would express less generalized trust, a hypothesis that the empirical analysis supported. But because Bitcoin relies on a highly controlled mathematical algorithm for its creation and transactions – as well as fixed supply – the technology applies an extreme form of control that can substitute for the absence of trust, just like the perceived value and durability of gold and other rare-earth specie currencies can compensate for such a dearth of trust.[29] Further supporting this view, the analysis identifies a tendency for countries with high proportions of Bitcoin Evangelists to have lower democratic tendencies. Democracy can be seen as a governance/control model that relies on greater mutual trust in society. By contrast, those countries with lower perceptions and usage of Bitcoin and other cryptocurrencies had higher generalized trust scores and tended to be more democratic. The delta between the two personality types and their native country represents the challenge Bitcoin and cryptocurrencies have for mass adoption.

This research also suggests that there are four mutually exclusive categories, or groups of individuals, in relation to Bitcoin and cryptocurrency attitudes and usage (personality types): Evangelist, Pragmatist, Skeptic, and Speculator. Further, these categories may correspond to

[29] Similar to trusting the mathematics of cryptography, in specie currencies users must trust the assayers and experts in validating the legitimacy of the currency.

analogous – but mirror-image – personality types with regards to perceptions and usage of state currencies. For example, those who are evangelists of the U.S. dollar or other top currencies are probably skeptics of Bitcoin. The tendency for there to be more individuals in the ING/Ipsos-surveyed countries to view similarly seven discrete uses of money and currency (from simple transactions to long-term savings) suggests our views of the multiple functions of money have, for many of us, coalesced around a single-purpose currency rather than different currencies for different functions. This suggests that the universal equivalent theory is partially correct, the equivalency part; there are, however, multiple spheres of utility among a few personality types. These types may *never* overlap, despite the BIS Venn diagram in Figure 1 suggesting currencies usages largely *do* overlap. This, too, is an area warranting further study based on these results.

Because there are individuals whose personal choice for a single currency is a non-state currency like Bitcoin, policymakers should be wary about how future innovations in currency will be received. The opportunity for non-state currencies to exist at least appears to have significant support in numerous countries despite what the policies may be or could be in the future. Central bank digital currencies may cut into the appeal of Bitcoin for some individuals, or it may legitimize the technology allowing competitor non-national currencies to emerge and flourish.

However, the research also suggests that policymakers may not be able to do much about the growth in popularity of cryptocurrencies, given its surprising finding that public policy is not correlated to Bitcoin and cryptocurrency perceptions and usage. While there were significant questions as this research was being formulated and conducted about whether public policy is an *independent* or *dependent* variable, a finding of no correlation between public policy and Bitcoin perceptions and usage only leads to further questions. Is public policy a control mechanism or

merely an indicator or barometer of public sentiment? Perhaps it depends on the vagaries of culture and custom in each country. At the very least, this research would suggest that public policy lags public sentiment (or takes time to have control effects, equally curious). However, because perceptions and usage were higher in countries that were *less* democratic – where autocratic control is more likely and could be weakened by non-national currency – one might think there would be a negative correlation of policy to perceptions and usage. By contrast, one might expect that countries that are *more* democratic, for instance, would have policies that are more in line with public sentiment, but this, too, was not the case: this research found no correlation between public policy and individuals' perceptions and usage of Bitcoin and cryptocurrency.

However, a possible explanation is that the rapidly changing landscape of Bitcoin and cryptocurrency is moving too fast for public policy to effectively keep up. As discussed earlier, this may be similar to the phenomena of other recent peer-to-peer technologies like music sharing, Airbnb, or Uber and Lyft. As those technological innovations (in some cases strictly corporations) were rapidly adopted around the world, business and government could not keep up with the disruptions to public services they caused. For instance, regulatory and fiscal models were based on traditional taxi and livery services, but Uber and Lyft were new definitions of transportation that successfully lobbied to be unregulated, for a time, and reduced governmental tax collection and increased regulatory activities (governmental expenses). However, policy slowly caught up the public's growing consumption of these innovations so now tax collection/remittance and basic rules to protect the public apply directly to their services. However, policy has yet to be able to compensate for the longer-term effects of disintermediation of employment and occupational hazards that leave the part-time drivers of Uber and Lyft

without long-term stable jobs and benefits. Similar unintended consequences could result from the long-term effects of denationalization of currency by Bitcoin and other cryptocurrencies, but where should the policy remedies take effect? At the state or provincial level, nationally, or international policymaking levels?

Finally, the finding that Bitcoin interest is not correlated with perceptions and usage – but is correlated with lower values on various socio-economic metrics – raises additional questions regarding who and what underpins interest in non-state currency systems. Are users seeking information about a non-state currency system like Bitcoin because of a perception of weakness in the state system? Or because of an interest in subverting the prevailing system? Remittance volumes involving national currencies may have some relationship to Bitcoin interest search results, but this research did not find any statistically significant reportable results, only vague indications that the remittance rates were higher in similarly low socio-economic countries with more Bitcoin interest. In any case, the fact that there is a strong correlation of interest from countries with lower socio-economic development, higher crime, and lower confidence in the armed forces, courts, and police warrants further study and analysis, and may be related to remittance volumes and immigration or emigration rates.

In summary, these findings ground the noisy conjecture surrounding Bitcoin and other cryptocurrencies and the speculative arguments that these monetary innovations may disrupt state currency systems and orthodox financial interests. By quantifying where and why Bitcoin and cryptocurrency are more or less favorably regarded around the world, these findings show the extent to which trends in usage and perception of emergent digital currencies are associated with basic cultural and attitudinal tendencies that are not necessarily related to public policy or other typical monetary theory-based controls. This research helps move scholars toward a

foundational understanding of digital currency as a socio-economic phenomenon – not just a novel, exotic financial trinket – and will help public policymakers better understand the options for and consequences of emergent non-state digital currencies. As countries around the world contemplate conversion of their national systems to a centralized digital currency and because of this research's analysis of user perceptions of Bitcoin and cryptocurrency, this research also sheds light on considerations for the adoption of state-backed (national) central bank digital currencies (CBDC). CBDCs would have similar technology adoption curves to Bitcoin, if not also trust and control considerations, because digital currency transactions are not as anonymous of the users as traditional cash transactions and digital systems are more difficult for users to access.

Other findings

Three interesting findings were by-products of this research. First, the United States had the highest favorable policy composite because of the number of political parties or politicians (as reported by Coin Dance according to the methodology above) with supportive policy positions regarding Bitcoin and cryptocurrency. It was coded as having a score on this measure of 9; most countries had a score of 0 or 1, with Russia having the second-highest score of 4. However, the U.S. did not have the highest rank in any favorability metric for perceptions and usage except those related to speculation, only nodes. If not for the favorable policy positions of parties or politicians, the U.S. would be in the middle of the policy favorability spectrum (approximately 12 with a range of 0-20 and an SD of approximately 4 for this index). It is not clear why the U.S. should have so many more politicians and political parties with stated support for Bitcoin and cryptocurrency than all other countries; this may be indicative of other latent considerations for policymakers. It may also be that the outsized measured level of political

support in the U.S. is related to the far higher per capita and total overall number of Bitcoin nodes and ATMs in the United States versus other countries. Node and ATM metrics were positively correlated to the composite public policy measure, GDP, and gold reserves, which suggests that there is a highly speculative component to the U.S. interest in Bitcoin – and that perhaps political parties and politicians feel the need to get on the bandwagon. Perhaps, too, Bitcoin ATM network owners and node owners are large contributors to certain politicians and parties.

It could, of course, be a weakness in the Coin Dance reporting system for political support (i.e., this research's methodology for this measurement), though it is the kind of reporting that enthusiasts and the politicians constantly monitor and presumably submit for correction to Coin Dance, not just in the U.S. but anywhere. So, while the U.S. was high (and presumed accurate) and the others were low, they are presumed accurate as well. The politicians are, after all, wanting as many people to know of this support as possible. For instance, while I could not have remembered the several U.S. political entities supporting Bitcoin, the listing on Coin Dance's site for the U.S. was all too familiar upon review – Ron Paul, Libertarians, Andrew Yang, etc. My sense is there is a reason why there is more political support (perhaps just "lip service" or vote pandering) in the U.S. than other countries but it is not apparent to me, yet. Further research is warranted as it could be related to overall trust and control factors.

Finally, the WVS Wave 6 dataset was the first to probe deeper into trust than prior waves of WVS. The primary trust question for prior waves had been whether respondents felt they could trust people or could not be too careful with other people, generalized trust only. For Wave 6, which was the wave used in this research, the concepts of in-group trust and out-group were also measured, and this research integrated those metrics. Throughout this analysis it

seemed like the nuances of in-group trust versus out-group trust could be an area of future study that may provide greater insight into Bitcoin and cryptocurrency perceptions and usage. The length of time between Fukuyama and others positing nuances to generalized trust (in-group/out-groups concepts of trust were developed in the 1990s) and when the first available survey results measured them (2014) is because of how long the WVS/EVS waves take to conduct. This is significant and could begin to reveal all sorts of possibilities after Wave 7 is conducted and longitudinal reviews of these concepts can be done.

Broader implications

This research helps us situate the phenomena of cryptocurrencies in relation to other currencies and gives us an overall classification of currency systems. It also suggests that we should avoid looking at the future of currency as a zero-sum game of displacement, with cryptocurrencies replacing fiat; such a simplistic view misunderstands the size of the global economy, the way currencies are intertwined and the pace of technology adoption. To put it simply, many people have smartphones, but a digital wallet replacing a hip-pocket or purse wallet is going to take a long time to reach seven billion people. In the meantime, the public and policymakers will need more data and information to understand these new currency possibilities and the consequences of possible public policy decisions in relation to them. They will need substantive and practical models to help make sense of the past, present, and future of currency systems. The trust and control matrix I have proposed can be useful in this regard.

More broadly, this research expands our theoretical understanding of currencies, providing a perspective on what makes a given system viable. This research considered not only economic but also social and political factors of the individuals expected to or clamoring to use these new cryptocurrencies. The hope is that this research will also offer a contextual theory for

better understanding non-national – perhaps digital – currencies' potential to supplement or supplant existing socio-economic values and exchanges, as well as the potential for disruption in currency systems that may be similar to those occurring in other areas due to peer-to-peer platforms (eBay, Airbnb, Uber).

Many discourses on currency talk about currency uniformly as the universal equivalent and often the primary, hegemonic currencies like the U.S. dollar or Chinese yuan, or euro as if they were the same thing, just in different languages. That may be the case with regard to those national currency systems, but a robust social theory of currency systems has to be able to encompass and differentiate all forms of economic exchange – whether they are fiat or cryptocurrencies, or less obvious or widespread types of value such as collectible baseball cards, rare art, complementary currencies, or hawala. Such a theory should be able to speak to how past currency systems were doing the same thing as today's system do, if with different media. That is to say, we have to figure out what does the thousand-pound stones on the island of Yap have in common with Bitcoin.

Areas and methods of future study

The main limitation of this research is the area most in need of future study: broadening the sample of countries with data on the dependent variables of cryptocurrency perception and usage. The ING/Ipsos survey was by far the best available data in the ten years of Bitcoin and cryptocurrency's existence, but it is frustratingly limited in sample size for deeply statistical – even control/treatment style experimentation – results. While the strength of the correlations and regressions was significant enough for reportable results in this research, there are likely nuances to other factors that were missed because of a small sample size. ING/Ipsos did a second survey that was released in late 2019 with what appear to be similar results to the 2018 survey;

beginning to differentially compare the results of the two surveys will provide a sense of change over time, but the 2019 survey still has only 15 countries.

There may be areas of the present research and future research that could look at socio-economics and cultural metrics normalized or controlled for population or country size that yield important insights. The present research created normalized metrics along these lines, but they were not significantly correlated with other metrics. A larger sample size and other methodological improvements could lead to discernible findings in normalized-by-population metrics.

In addition to a larger sample size, one important methodological approach to pursue in future research would be to integrate the IV and DV metrics into a single survey instrument (with a larger sample size per country and of more countries), so that hierarchal or multilevel modeled linear regressions could be done. This, too, would likely result in strengthened support for the findings in this research but also reveal additional areas of significant ranges of trust and control for monetary choices, including for a new currency like Bitcoin. The present research was cross-sectional and an important first step, but a longitudinal series of surveys and research is a logical next step; specifically, combining the ING/Ipsos questions with WVS/EVS trust and cultural questions over multi-year iterations in 30+ countries with at least 1,000 responses per country would be an ideal goal for research of this type. There are, I believe, several trade publications and industry-focused companies that could be partnered with rigorous social science researchers to plan and execute such research.

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Appendices

Appendix A

ING/Ipsos Survey Instrument Section on Cryptocurrencies:

In this part of the survey, we will ask you some questions about your awareness and knowledge of cryptocurrencies.

20	Have you ever heard of cryptocurrency? If so, do you own any? I have heard of cryptocurrency | I own some cryptocurrency | I expect to own cryptocurrency in the future With grid options for each item: Yes No <goto car sharing questions if 'no' for all 3 options>
21	Crypto-money or cryptocurrency is a kind of digital currency. This currency is not created nor secured by the government, but by a network of individuals. Bitcoin is the best known example. Please indicate how much you agree or disagree with the following statements. "Digital currencies – such as Bitcoins – are the future of spending online" "Digital currencies – such as Bitcoins – are the future of investment as storage of value" "I think the value of digital currencies – such as Bitcoins – will increase in the next 12 months" With grid options for each item: Strongly agree, Agree, Neither agree or disagree, Disagree, Strongly disagree, I don't have an opinion
22	Cryptocurrencies are a type of asset. How would you compare the risk of owning cryptocurrency compared to the following alternative assets? Cash, Government bonds, Stock market investment, Real estate/property funds, Gold, Investing in your own business With grid options for each item: Much higher risk compared to holding cryptocurrency Higher risk compared to holding cryptocurrency Lower risk compared to holding cryptocurrency Much lower risk compared to holding cryptocurrency About the same risk as holding cryptocurrency
23	If you had money available (about 1 month's take-home/net pay) and you wanted some more information on cryptocurrency as a possible investment, where would you most likely get advice? PROG: Randomise categories (except last category) <select only 1> An independent financial advisor or bank advisor My friends/My family The internet and specialist websites An online computer program or algorithm that provides tailored advice I (would) never invest money in cryptocurrency I don't know

24	Would you use cryptocurrencies – such as Bitcoin - for the following activities if you had the option? Buy cup of coffee Receive your take-home pay Pay taxes Pay your monthly electricity bill Buy a plane fare Make an international payment for a product you buy online Save for your child's university fees With grid options for each item: PROG: MP Yes EXCLUSIVE No, I don't want to change the way I pay No, I think there would be too much risk No, Bitcoin is interesting to me only as an investment

Appendix B

World Values Survey questions used for this research from Wave 6, 2014:

V24. Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people? (*Code one answer*):

1 Most people can be trusted.
2 Need to be very careful.

I 'd like to ask you how much you trust people from various groups. Could you tell me for each whether you trust people from this group completely, somewhat, not very much or not at all? (*Read out and code one answer for each*):

	Trust completely	Trust somewhat	Do not trust very much	Do not trust at all
V102. Your family	1	2	3	4
V103. Your neighborhood	1	2	3	4
V104. People you know personally	1	2	3	4
V105. People you meet for the first time	1	2	3	4
V106. People of another religion	1	2	3	4
V107. People of another nationality	1	2	3	4

I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all? (*Read out and code one answer for each*):

	A great deal	Quite a lot	Not very much	None at all
V108. The churches	1	2	3	4
V109. The armed forces	1	2	3	4
V110. The press	1	2	3	4
V111. Television	1	2	3	4
V112. Labor unions	1	2	3	4
V113. The police	1	2	3	4
V114. The courts	1	2	3	4
V115. The government (in your nation's capital)	1	2	3	4
V116. Political parties	1	2	3	4
V117. Parliament	1	2	3	4
V118. The Civil service	1	2	3	4
V119. Universities	1	2	3	4
V120. Major Companies	1	2	3	4
V121. Banks	1	2	3	4
V122. Environmental organizations	1	2	3	4
V123. Women's organizations	1	2	3	4
V124. Charitable or humanitarian organizations	1	2	3	4
V125. The [**European Union**]**	1	2	3	4
V126. The United Nations	1	2	3	4

* [*Substitute "religious organizations" in non-Christian countries; "the Church" in Catholic countries*]
** [*Substitute appropriate regional organization outside Europe (e.g., in North America, NAFTA)*]

I'm going to describe various types of political systems and ask what you think about each as a way of governing this country. For each one, would you say it is a very good, fairly good, fairly bad or very bad way of governing this country? (*Read out and code one answer for each*):

		Very good	Fairly good	Fairly bad	Very bad
V127.	Having a strong leader who does not have to bother with parliament and elections	1	2	3	4
V128.	Having experts, not government, make decisions according to what they think is best for the country	1	2	3	4
V129.	Having the army rule	1	2	3	4
V130.	Having a democratic political system	1	2	3	4

(*Show Card T*)

Many things are desirable, but not all of them are essential characteristics of democracy. Please tell me for each of the following things how essential you think it is as a characteristic of democracy. Use this scale where 1 means "not at all an essential characteristic of democracy" and 10 means it definitely is "an essential characteristic of democracy" (*read out and code one answer for each*):

		Not an essential characteristic of democracy									An essential characteristic of democracy
V131.	Governments tax the rich and subsidize the poor.	1	2	3	4	5	6	7	8	9	10
V132.	Religious authorities ultimately interpret the laws.	1	2	3	4	5	6	7	8	9	10
V133.	People choose their leaders in free elections.	1	2	3	4	5	6	7	8	9	10
V134.	People receive state aid for unemployment.	1	2	3	4	5	6	7	8	9	10
V135.	The army takes over when government is incompetent.	1	2	3	4	5	6	7	8	9	10
V136.	Civil rights protect people from state oppression.	1	2	3	4	5	6	7	8	9	10
V137.	The state makes people's incomes equal.	1	2	3	4	5	6	7	8	9	10
V138.	People obey their rulers.	1	2	3	4	5	6	7	8	9	10
V139	Women have the same rights as men.	1	2	3	4	5	6	7	8	9	10

(*Show Card U*)

V140. How important is it for you to live in a country that is governed democratically? On this scale where 1 means it is "not at all important" and 10 means "absolutely important" what position would you choose? (*Code one number*):

Not at all important									Absolutely important
1	2	3	4	5	6	7	8	9	10

(*Show Card V*)

V141. And how democratically is this country being governed today? Again using a scale from 1 to 10, where 1 means that it is "not at all democratic" and 10 means that it is "completely democratic," what position would you choose? (*Code one number*):

Not at all democratic									Completely democratic
1	2	3	4	5	6	7	8	9	10

Appendix C

European Values Study items used for this research from 2017 questions:

Q7 Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?

1 – most people can be trusted
2 – can't be too careful
8 – don't know (spontaneous)
9 – no answer (spontaneous)

☐ (v31)

SHOW CARD 8 – READ OUT AND CODE ONE ANSWER LINE

Q8 I would like to ask you how much you trust people from various groups. Could you tell me for each whether you trust people from this group completely, somewhat, not very much or not at all?

		Trust completely	Trust somewhat	Do not trust very much	Do not trust at all	DK	NA
v32	Your family	1	2	3	4	8	9
v33	People in your neighbourhood	1	2	3	4	8	9
v34	People you know personally	1	2	3	4	8	9
v35	People you meet for the first time	1	2	3	4	8	9
v36	People of another religion	1	2	3	4	8	9
v37	People of another nationality	1	2	3	4	8	9

SHOW CARD 38 – READ OUT AND CODE ONE ANSWER PER LINE

Q38 Please look at this card and tell me, for each item listed, how much confidence you have in them, is it a great deal, quite a lot, not very much or none at all?

		a great deal	quite a lot	not very much	none at all	DK	NA
v115	The church	1	2	3	4	8	9
v116	The armed forces	1	2	3	4	8	9
v117	The education system	1	2	3	4	8	9
v118	The press	1	2	3	4	8	9
v119	Trade unions	1	2	3	4	8	9
v120	The police	1	2	3	4	8	9
v121	Parliament	1	2	3	4	8	9
v122	Civil service	1	2	3	4	8	9
v123	The social security system	1	2	3	4	8	9
v124	The European Union	1	2	3	4	8	9
v125	United Nations Organisation	1	2	3	4	8	9
v126	Health care system	1	2	3	4	8	9
v127	The justice system	1	2	3	4	8	9
v128	Major companies	1	2	3	4	8	9
v129	Environmental organisations	1	2	3	4	8	9
v130	Political parties	1	2	3	4	8	9
v131	Government	1	2	3	4	8	9
v132	Social media	1	2	3	4	8	9

SHOW CARD 39 – READ OUT AND CODE ONE ANSWER PER LINE

Q39 Many things are desirable, but not all of them are essential characteristics of democracy. Please tell me for each of the following things how essential you think it is as a characteristic of democracy. Use this scale where 1 means "not at all an essential characteristic of democracy" and 10 means it definitely is "an essential characteristic of democracy"

		Not at all an essential characteristic of democracy									An essential characteristic of democracy	It is against democracy [DO NOT READ OUT]	DK	NA
v133	Governments tax the rich and subsidise the poor	1	2	3	4	5	6	7	8	9	10	0	88	99
v134	Religious authorities ultimately interpret the laws	1	2	3	4	5	6	7	8	9	10	0	88	99
v135	People choose their leaders in free elections	1	2	3	4	5	6	7	8	9	10	0	88	99
v136	People receive state aid for unemployment	1	2	3	4	5	6	7	8	9	10	0	88	99
v137	The army takes over when government is incompetent	1	2	3	4	5	6	7	8	9	10	0	88	99
v138	Civil rights protect people from state oppression	1	2	3	4	5	6	7	8	9	10	0	88	99
v139	The state makes people's incomes equal	1	2	3	4	5	6	7	8	9	10	0	88	99
v140	People obey their rulers.	1	2	3	4	5	6	7	8	9	10	0	88	99
v141	Women have the same rights as men	1	2	3	4	5	6	7	8	9	10	0	88	99

SHOW CARD 40

Q40 How important is it for you to live in a country that is governed democratically? On this scale where 1 means it is "not at all important" and 10 means "absolutely important" what position would you choose? ☐☐ (v142)

Not at all important									Absolutely important	Don't know	No answer
1	2	3	4	5	6	7	8	9	10	88	99

SHOW CARD 41

Q41 And how democratically is this country being governed today? Again using a scale from 1 to 10, where 1 means that it is "not at all democratic" and 10 means that it is "completely democratic," what position would you choose?

☐☐ (v143)

Not at all democratic								Completely democratic		Don't Know	No Answer
1	2	3	4	5	6	7	8	9	10	88	99

SHOW CARD 43 – READ OUT AND CODE ONE ANSWER PER LINE

Q43 I'm going to describe various types of political systems and ask what you think about each as a way of governing this country. For each one, would you say it is a very good, fairly good, fairly bad or very bad way of governing this country?

		very good	fairly good	fairly bad	very bad	DK	NA
v145	Having a strong leader who does not have to bother with parliament and elections	1	2	3	4	8	9
v146	Having experts, not government, make decisions according to what they think is best for the country	1	2	3	4	8	9
v147	Having the army rule the country	1	2	3	4	8	9
v148	Having a democratic political system	1	2	3	4	8	9

Appendix D

Margins of error at 95% confidence level (Tausch, 2019):

Sample Size	Error Margins (±) for the Resulting Percentages	Error Margins (±) for the Resulting Percentages	Error Margins (±) for the Resulting Percentages	Error Margins (±) for the Resulting Percentages	Error Margins (±) for the Resulting Percentages
n	10% or 90%	20% or 80%	30% or 70%	40% or 60%	50%
20	13.1%	17.5%	20.1%	21.5%	21.9%
30	10.7%	14.3%	16.4%	17.5%	17.9%
40	9.3%	12.4%	14.2%	15.2%	15.5%
50	8.3%	11.1%	12.7%	13.6%	13.9%
75	6.8%	9.1%	10.4%	11.1%	11.3%
100	5.9%	7.8%	9.0%	9.6%	9.8%
250	3.7%	5.0%	5.7%	6.1%	6.2%
500	2.6%	3.5%	4.0%	4.3%	4.4%
1000	1.9%	2.5%	2.8%	3.0%	3.1%
2000	1.3%	1.8%	2.0%	2.1%	2.2%

Appendix E

Ipsos-only countries' response frequency and descriptives statistics:

I have:		Heard of Crypto		Own Crypto		Expect to Own	
Country		Frequency	Percent	Frequency	Percent	Frequency	Percent
Austria	No	209	20.7	925	91.7	817	81.0
	Yes	800	79.3	84	8.3	192	19.0
	Total	1009	100.0	1009	100.0	1009	100.0
Belgium	No	625	62.0	963	95.5	907	90.0
	Yes	383	38.0	45	4.5	101	10.0
	Total	1008	100.0	1008	100.0	1008	100.0
France	No	531	50.1	999	94.2	882	83.2
	Yes	529	49.9	61	5.8	178	16.8
	Total	1060	100.0	1060	100.0	1060	100.0
Germany	No	298	29.7	928	92.3	796	79.2
	Yes	707	70.3	77	7.7	209	20.8
	Total	1005	100.0	1005	100.0	1005	100.0
Italy	No	304	29.9	939	92.2	778	76.4
	Yes	714	70.1	79	7.8	240	23.6
	Total	1018	100.0	1018	100.0	1018	100.0
Luxembourg	No	181	32.7	531	96.0	487	88.1
	Yes	372	67.3	22	4.0	66	11.9
	Total	553	100.0	553	100.0	553	100.0
Netherlands	No	468	45.5	954	92.7	890	86.5
	Yes	561	54.5	75	7.3	139	13.5
	Total	1029	100.0	1029	100.0	1029	100.0
Poland	No	233	22.8	906	88.6	722	70.6
	Yes	790	77.2	117	11.4	301	29.4
	Total	1023	100.0	1023	100.0	1023	100.0
Romania	No	255	25.3	881	87.5	621	61.7
	Yes	752	74.7	126	12.5	386	38.3
	Total	1007	100.0	1007	100.0	1007	100.0
Spain	No	338	33.2	917	90.0	693	68.0
	Yes	681	66.8	102	10.0	326	32.0
	Total	1019	100.0	1019	100.0	1019	100.0
Turkey	No	299	29.3	836	81.9	557	54.6
	Yes	722	70.7	185	18.1	464	45.4
	Total	1021	100.0	1021	100.0	1021	100.0
United Kingdom	No	400	39.4	955	94.0	871	85.7
	Yes	616	60.6	61	6.0	145	14.3
	Total	1016	100.0	1016	100.0	1016	100.0
Czech Republic	No	317	30.7	939	91.1	839	81.4
	Yes	714	69.3	92	8.9	192	18.6
	Total	1031	100.0	1031	100.0	1031	100.0
USA	No	438	43.5	930	92.3	803	79.7
	Yes	570	56.5	78	7.7	205	20.3
	Total	1008	100.0	1008	100.0	1008	100.0
Australia	No	306	30.0	957	93.7	873	85.5
	Yes	715	70.0	64	6.3	148	14.5
	Total	1021	100.0	1021	100.0	1021	100.0

Usage Type Index Mean by Country					
		Evangelist	Pragmatist	Skeptic	Prospector
Austria	Valid N	807.0	807.0	807.0	807.0
	Missing N	202.0	202.0	202.0	202.0
	Mean	0.9	3.8	1.5	1.1
Belgium	Valid N	395.0	395.0	395.0	395.0
	Missing N	613.0	613.0	613.0	613.0
	Mean	0.8	3.7	1.6	1.1
France	Valid N	561.0	561.0	561.0	561.0
	Missing N	499.0	499.0	499.0	499.0
	Mean	1.1	3.4	1.4	1.3
Germany	Valid N	721.0	721.0	721.0	721.0
	Missing N	284.0	284.0	284.0	284.0
	Mean	1.0	3.6	1.5	1.1
Italy	Valid N	727.0	727.0	727.0	727.0
	Missing N	291.0	291.0	291.0	291.0
	Mean	2.0	2.9	1.2	1.0
Luxembourg	Valid N	383.0	383.0	383.0	383.0
	Missing N	170.0	170.0	170.0	170.0
	Mean	0.7	4.1	1.4	1.1
Netherlands	Valid N	581.0	581.0	581.0	581.0
	Missing N	448.0	448.0	448.0	448.0
	Mean	0.7	3.9	1.7	0.9
Poland	Valid N	812.0	812.0	812.0	812.0
	Missing N	211.0	211.0	211.0	211.0
	Mean	1.5	3.0	1.6	1.1
Romania	Valid N	776.0	776.0	776.0	776.0
	Missing N	231.0	231.0	231.0	231.0
	Mean	2.2	2.6	1.1	1.2
Spain	Valid N	738.0	738.0	738.0	738.0
	Missing N	281.0	281.0	281.0	281.0
	Mean	1.8	2.9	1.4	1.1
Turkey	Valid N	768.0	768.0	768.0	768.0
	Missing N	253.0	253.0	253.0	253.0
	Mean	2.6	2.7	0.7	1.1
United Kingdom	Valid N	627.0	627.0	627.0	627.0
	Missing N	389.0	389.0	389.0	389.0
	Mean	0.9	3.6	1.8	1.0
Czech Republic	Valid N	720.0	720.0	720.0	720.0
	Missing N	311.0	311.0	311.0	311.0
	Mean	1.2	3.4	1.1	1.4
USA	Valid N	606.0	606.0	606.0	606.0
	Missing N	402.0	402.0	402.0	402.0
	Mean	1.4	3.1	1.8	1.1
Australia	Valid N	727.0	727.0	727.0	727.0
	Missing N	294.0	294.0	294.0	294.0
	Mean	0.8	3.7	2.0	0.9

Google Trends, ATMs, Bitcoin Nodes in ING/Ipsos Sample Countries						
Country	**Google Trend**	**ATMs**	**Nodes**	**Population(M)**	**ATMs/Cap(M)**	**Nodes/Cap(M)**
USA	6	3702	2363	327.096	11.3178	7.2242
Australia	7	25	132	24.898	1.0041	5.3016
Netherlands	8	42	496	17.06	2.4619	29.0739
United K.	8	273	301	67.142	4.0660	4.4830
Belgium	8	14	40	11.482	1.2193	3.4837
Czech Rep.	8	69	82	10.666	6.4692	7.6880
Luxembourg	9	0	10	0.604	0.0000	16.5563
Romania	9	38	41	19.506	1.9481	2.1019
Poland	10	48	50	37.922	1.2658	1.3185
Turkey	11	25	13	82.34	0.3036	0.1579
France	11	2	606	64.991	0.0308	9.3244
Austria	12	251	52	8.891	28.2308	5.8486
Italy	13	54	70	60.627	0.8907	1.1546
Germany	14	36	1891	83.124	0.4331	22.7491
Spain	19	94	59	46.693	2.0131	1.2636

State/public Policy Dimensions and Composite in ING/Ipsos Sample Countries										
Country	**Comp.**	**Legality**	**Classific.**	**Exchange**	**ICO**	**Political**	**Payments**	**Fiat Cv**	**Legislation**	**Warning**
Romania	8	1	3	1	1	0	0	1	0	1
Belgium	9	2	0	2	2	0	1	1	0	1
Italy	10	2	0	2	2	1	1	1	1	0
Czech Rep.	10	2	2	2	2	0	1	1	0	0
Australia	11	2	1	2	2	0	1	1	1	1
United K.	11	2	2	2	2	0	1	1	1	0
France	11	2	0	2	2	1	1	1	1	1
Poland	12	1	3	2	2	1	0	1	1	1
Spain	14	2	3	2	2	1	1	1	1	1
Austria	14	2	2	2	3	1	1	1	1	1
Turkey	14	3	2	3	3	0	0	1	1	1
Netherlands	16	3	2	3	3	1	1	1	1	1
Luxembourg	16	2	4	3	3	0	1	1	1	1
Germany	16	3	2	2	3	2	1	1	1	1
USA	21.5	2	2.5	2	2	9	1	1	1	1

Basic Demographic Factors in ING/Ipsos Sample Countries								
Country	**GDP(B)**	**Gini**	**HDI**	**Happy**	**Net Mig.(K)**	**Net Mg (1/K Pop)**	**Population (M)**	**Population Dens.(Pop./sq KM)**
Luxembourg	69.49	33.8	0.904	7.0903	49	16.3	0.604	250
Romania	239.55	35.9	0.811	6.0697	-370	-3.8	19.506	85
Czech Republic	245.23	25.9	0.888	6.8521	110	2.1	10.666	138
Austria	455.74	30.5	0.908	7.246	325	7.4	8.891	107
Belgium	531.77	27.7	0.916	6.923	240	4.2	11.482	377
Poland	585.78	31.8	0.865	6.1817	-147	-0.8	37.922	124
Turkey	766.51	41.9	0.791	5.3726	1420	3.5	82.340	107
Netherlands	913.66	28.2	0.931	7.4876	80	0.9	17.060	511
Spain	1426.19	36.2	0.891	6.3541	200	0.9	46.693	94
Australia	1432.20	35.8	0.939	7.228	791	6.4	24.898	3
Italy	2073.90	35.4	0.88	6.2234	745	2.5	60.627	205
France	2777.54	32.7	0.901	6.5921	183	0.6	64.991	122
United K.	2825.21	33.2	0.922	7.0537	1303	3.9	67.142	275
Germany	3996.76	31.7	0.936	6.985	2719	6.6	83.124	237
USA	20494.10	41.5	0.924	6.8923	4774	2.9	327.096	36

Foreign Exchange-Monetary/Gold Factors in ING/Ipsos Sample Countries							
Country	**ForExUSD**	**ForExCNY**	**ForExEUR**	**Gold Rsvs(T)**	**Rsvs FX ex-Gold(M)**	**Rsvs FX w-Gold(M)**	**Resvs Gold %**
Australia	1.322	0.206	1.544	80.000	53259.014	56475.271	0.057
Netherlands	0.856	0.133	1.000	612.454	12215.851	36838.462	0.668
Italy	0.856	0.133	1.000	2451.837	49980.286	148552.009	0.664
United K.	0.749	0.117	0.874	310.287	142966.009	155440.551	0.080
USA	1.000	0.156	1.168	8133.462	114057.675	441049.007	0.741
Luxembourg	0.856	0.133	1.000	2.239	824.896	914.928	0.098
Germany	0.856	0.133	1.000	3369.880	59192.352	194672.357	0.696
Spain	0.856	0.133	1.000	281.578	57712.845	69033.168	0.164
Austria	0.856	0.133	1.000	279.991	12681.825	23938.376	0.470
Turkey	4.601	0.717	5.373	281.578	57712.845	69033.168	0.164
Poland	0.856	0.133	1.000	102.967	104814.664	108954.260	0.038
Belgium	0.856	0.133	1.000	227.396	17125.484	26267.524	0.348
Romania	0.856	0.133	1.000	103.698	36985.450	41154.451	0.101
France	0.856	0.133	1.000	2436.036	65715.578	163652.073	0.598
Czech Rep.	0.856	0.133	1.000	9.278	143809.982	144182.988	0.003

Trust Factors of Society and Government in ING/Ipsos Sample Countries										
Country	**People Can Be Trusted**	**Trust Family**	**Trust Neighbor**	**People Known Person**	**People Met for 1st Time**	**People Another Relig**	**People Another Nation**	**Imp. Live In Dem.**	**Dem. is Country Today**	**EIU Dem. Index**
Romania	7.70	3.77	2.38	2.57	1.62	1.97	1.96	8.57	5.04	6.38
Turkey	11.60	3.93	3.22	3.08	1.94	2.16	2.17	8.57	6.41	4.37
Spain	19.90	3.92	3.05	3.26	2.23	2.45	2.45	8.64	6.64	8.08
Cz. Rep.	21.70	3.83	2.99	3.22	2.30	2.42	2.32	8.16	5.80	7.69
Poland	22.20	3.67	2.81	2.96	2.07	2.54	2.55	8.70	5.89	6.67
France	27.70	3.64	2.91	3.30	2.18	2.73	2.78	8.74	6.47	7.80
Italy	27.90	3.84	2.87	2.81	2.09	2.51	2.53	9.20	6.04	7.71
USA	34.80	3.65	2.76	3.21	2.20	2.71	2.66	8.41	6.46	7.96
UK	41.20	3.85	3.05	3.53	2.49	2.93	2.94	8.83	6.62	8.53
Germany	44.60	3.71	2.83	3.06	2.15	2.52	2.51	8.94	7.23	8.68
Austria	47.00	3.83	3.11	3.31	2.31	2.52	2.58	9.11	7.42	8.29
Australia	51.40	3.81	2.79	3.36	2.33	2.64	2.70	8.83	6.79	9.09
Netherlnd	66.10	3.53	2.84	3.08	2.11	2.39	2.35	8.87	7.29	8.89
Luxemb.	-	-	-	-	-	-	-	-	-	8.81
Belgium	-	-	-	-	-	-	-	-	-	7.78

Vita

Joseph Buckler Walton was born in June 1975, in Richmond, Virginia, and is a U.S. citizen. He graduated from Meadowbrook High School, Richmond Virginia in 1993. He earned a Bachelor of Science in Science with a minor in Physics from Virginia Commonwealth University (VCU), Richmond, Virginia in 2009. He earned a Master of Public Administration with a concentration in Executive Leadership from VCU's L. Douglas Wilder School of Government and Public Affairs in 2015.

He served as a member and Chair of the County of Powhatan Board of Supervisors from 2008-2011 and he has been active in public policy and political matters in central Virginia for many years, including as a candidate for Congress from Virginia's 7th District in 2018.

Professionally, he has been an active leader in the information technology and non-profit fields in central Virginia. He holds a CISSP among other technology industry certifications in infrastructure and information security disciplines and he is a distributed computing devotee, originally with distributed.net & SETI@home, and a former Bitcoin miner. His social and information science research interests focus on policy implications for use cases of cryptocurrencies and blockchains to support digital identity, security, privacy, socio-economic value exchange, and decentralized governance to further liberal democratic principles. His full vita can be found at https://www.joewalton.com.